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59th ANNUAL REPORT

OF THE DIRECTOR TO THE HON. THE MINISTER FOR AGRICULTURE AND STOCK

(As required by "The Sugar Experiment Stations Acts, 1900 to 1957")

BUREAU OF SUGAR EXPERIMENT STATIONS

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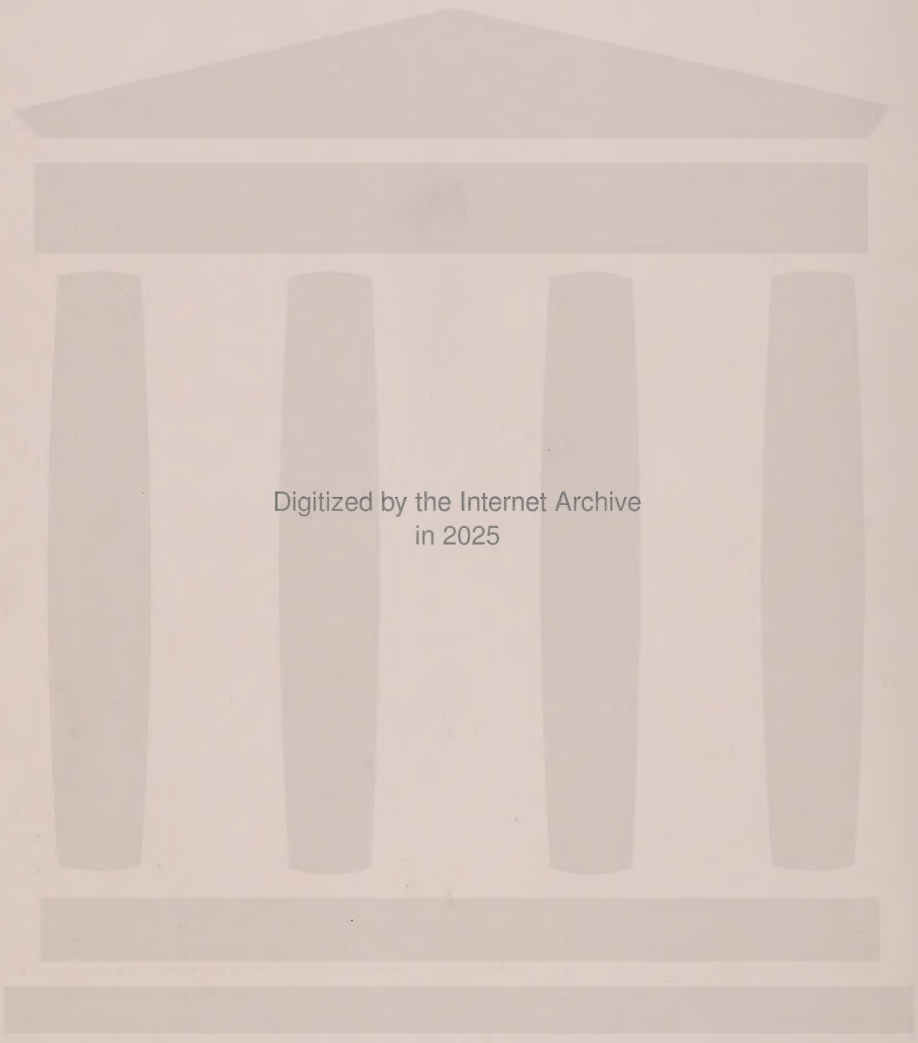
BRISBANE • QUEENSLAND

1959

COMMONWEALTH MYCOLOGICAL INSTITUTE
22 DEC 1959



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59th ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

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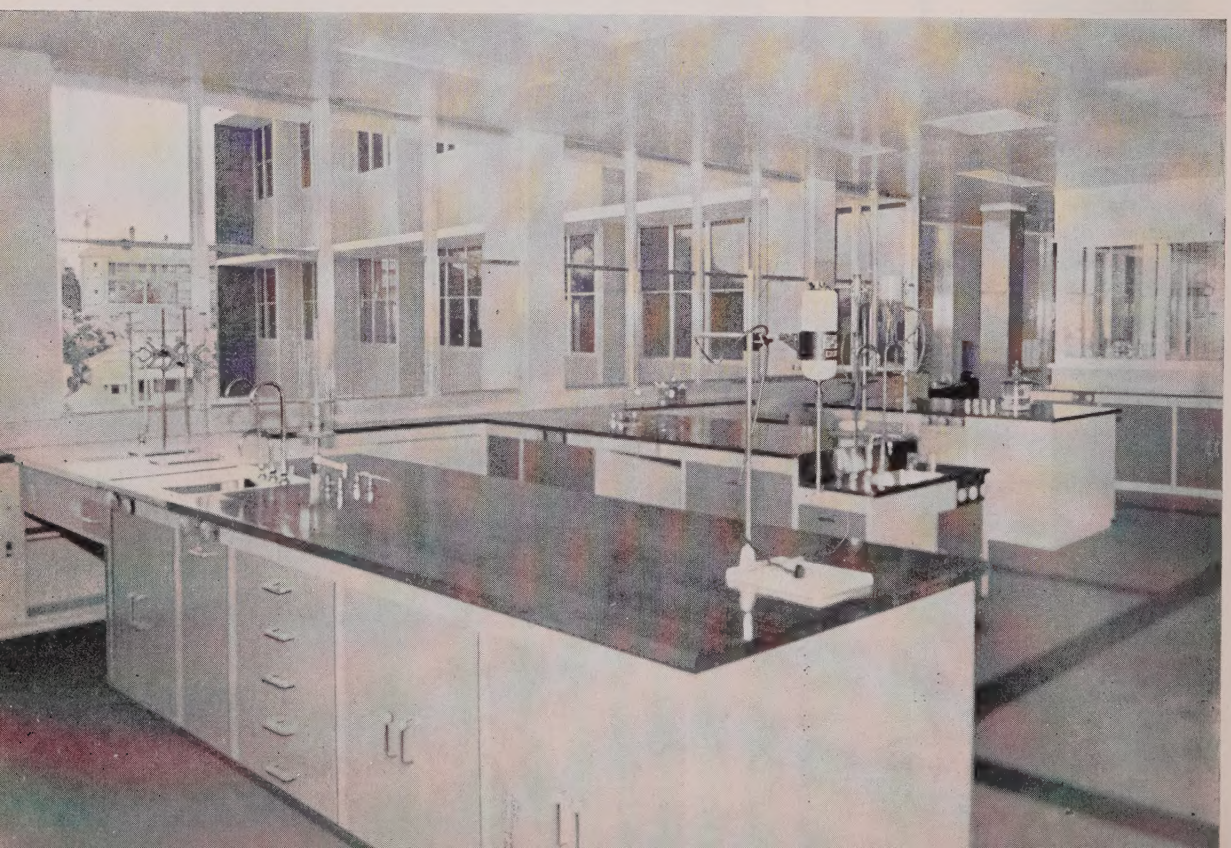
Our Cover

The Bureau's new headquarters building in Brisbane. The photograph shows the front wing which faces Gregory Terrace.

A newly approved variety—Q.69—which appears well suited to the somewhat exacting conditions of the Isis area.

The attractive entrance vestibule of the Bureau's new building. The mural depicts the damage formerly caused by white grub depredations, and the undamaged crops resulting from insecticidal treatment.

Section of one of the new laboratories for soils work. In the right background is the constant-temperature metrology room.



Fifty-ninth Annual Report of the Bureau of Sugar Experiment Stations

To the Honourable the Minister for Agriculture and Stock

Dear Sir,

The Annual Report which follows reviews the period from July 1st, 1958 to June 30th, 1959.

The outstanding feature of this "sugar year" has been the restraining effect of Sugar Board acquisitions on raw-sugar production. In the middle of the 1958 season the Sugar Board announced its intention to acquire third quota sugar up to ten per cent. of individual mill peaks, and a further tonnage, nominated as fourth quota sugar, up to 2½ per cent. of individual mill peaks; this lastmentioned figure was increased in October to five per cent. However, at time of writing (September, 1959), the Sugar Board has made no announcement in regard to either third or fourth quota sugar for the current season, and it is concluded, following the many statements made from authoritative sources, that the 1959 production will be strictly limited to the aggregate of mill peaks.

Since any restriction measures are dictated by markets for sugar, the restriction on production must necessarily begin at the top, by limitation of sugar manufactured. Ultimately the curbing of production will need to be implemented on the farms, and there is already evidence of reduction of areas and farming efficiency in most districts.

The surplus cane produced in the 1958 season was, in some cases, ploughed into the soil and, in others, retained as a standover crop for 1959. Doubtless, many growers gambled on the occurrence of an unforeseen outlet which would allow of extra sugar sales, while others protected themselves against a climatic disaster which might drastically reduce their 1959 production. This latter form of insurance paid off to some extent in the Lower Burdekin, where a severe cyclonic blow in early 1959 reduced the one-year crop to such extent that much of the standover cane will be needed to reach farm peak tonnages. However, a deal of the two-year cane has deteriorated to such degree that it will not be economical to pay the higher harvesting costs.

In other areas where cane was stoodover, its insurance value is nil. A favourable growing season has ensured mill peak requirements from the one-year crop and growers are now faced with destroying large tonnages of recumbent, two-year cane. The surplus production already experienced, and the threat of continuing over production in future years, has initiated an undesirable corrective practice. The logical and most economic method of reducing the cane tonnage grown is to farm a smaller acreage at the same high standard of efficiency; but the trend in many of the cane farming communities is to reduce fertilizer applications, number of irrigation rounds and cultivations. The net result of these forms of crop control is to raise cost of production per ton of cane. While appreciating the difficulties inherent in planning production with a crop which is planted only once in three or four years, there is no problem in reducing farmed acreage; either the acreage planted or the acreage ratooned in any given year can be directly related to the following year's crop.

The major industrial development of the industry during the twelve months was the completion, and putting into full operation, of the two bulk sugar terminals at Lucinda Point and Bundaberg. These installations follow the general pattern of the first terminal at Mackay, and will be followed, in turn, by the Townsville and Mourilyan Harbour terminals to be completed this year and next year respectively.

The succession of over-peak seasons, and their culmination in surplus production has not, in any

way, lessened the demands made on the agricultural side for improved services and information. Despite too much cane being grown there is a growing—not a lessening—interest in better producing varieties, in improved farm husbandry on marginal lands, in newer insecticides and weedicides and in many other facets of the Bureau's services. This is a healthy symptom and indicates the awareness of growers to the need for reducing costs in an industry where the selling price is fixed.

Perhaps the greatest demand exists in the field of special purpose cane varieties. Generally, there is a need for higher-sugar-content canes in the south, for wind resistant types in the Lower Burdekin and further north districts, for leaf scald resistant varieties in the far north, and for a range of canes capable of producing more sugar in the cloudy, wet belt. Some of these requirements are responsible for the establishment this year of two new seedling introduction areas at Tully and Childers, supplementing the existing seedling sub-stations and plots at Babinda, Mourilyan, Ingham and Nambour.

The Bureau and several other organizations and mills were represented this year at the triennial Congress of the International Society of Sugar Cane Technologists. These congress meetings act as a clearing house for technical advances made in sugar agriculture and manufacture on an international level and, as such, provide a valuable and ready means of maintaining contact with overseas thought. The international congresses are mainly agricultural in scope and this aspect should be kept in correct perspective when planning future delegations.

During the latter part of the year under review the Committee which you appointed to investigate the cane-analytical side of cane payment methods continued its work. In particular the Com-

Q.58 is making rapid headway in several areas. Here the variety shows its prolific stooling characteristic in the Ingham district.

This Bundaberg-produced seedling, L.74, seems well adapted to Ingham Line conditions.

mittee, consisting of the Director and the Senior Mill Technologist of the Bureau, the Chief Chemist of the Colonial Sugar Refining Company and the Chemist of the Central Sugar Cane Prices Board, laid down detailed plans for the 1959 seasonal campaign. It is anticipated that considerable progress will be made in the matter by the end of the year. In addition to the basic investigations into cane analysis methods the Committee will be maintaining close touch with all mills operating juice scales, and is endeavouring to have them operate their equipment according to a uniform method.

THE 1958 SEASON

From June 5th, 1958 to January 3rd, 1959 crops were harvested, transported and crushed in the State's thirty-one mill areas. The average length of crushing season was twenty-three weeks. The total cane harvested and crushed aggregated 9,740,795 tons, and this included the third and fourth quota sugar mentioned earlier. The harvested crop was 795,000 tons higher than in 1957, but it fell short of the 1954 record harvest by 124,000 tons. In addition to the cane harvested, there was left in the fields an undetermined amount calculated at up to a million tons, but even an approximate figure is not officially known.

The harvested area from which the above tonnage came was 356,210 acres, a drop of 8,775 acres on the preceding year. This lastmentioned area would have produced another quarter million tons of cane, so it would appear that the *harvestable* acreage in 1958 would have been considerably larger than in 1957 had all the sugar been acquired.

The sugar produced was a record. The 1,353,543 tons of 94 n.t. sugar exceeded the previous best by approximately 52,000 tons even though the weight of processed cane was lower. This was made possible by a better cane/sugar ratio. The tons of cane required to make a ton of sugar in 1958 was 7.20 against 7.58 in the previous record year of sugar production (1954). The ratio in 1957 was 7.12. The year was a fairly favourable one for sucrose production and storage in the plant, and the influence of sweeter varieties was very evident at Babinda and Bundaberg.

The New South Wales crop amounted to 471,798 tons of cane and 58,777 tons of 94 n.t. sugar. The total Australian output therefore became 10,212,593 tons cane and 1,412,320 tons 94 n.t. sugar.

An indication of crop processing rate is obtained by taking a period at the peak of the season and assessing the average, weekly, aggregate crushing. For the 1958 season it is found that, for seven weeks ending September 27th, the thirty-one mills were handling an average of 431,859 tons of cane per week, an increase of 6,000 tons per week on the 1957 performance. This was an achievement worth recording since, due to some restriction on sugar production, there was no particular incentive to break crushing records.

A dry harvesting season was conducive to high crushing rates, and cane in most districts

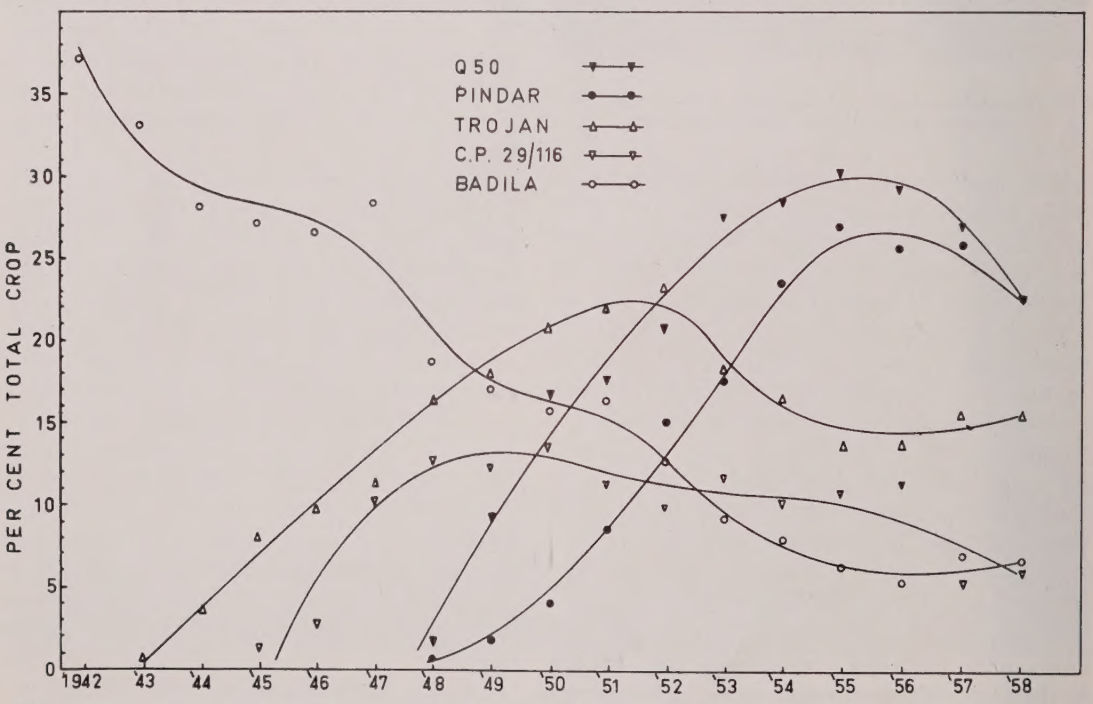
was in good condition for both harvesting and processing. The exceptions were in parts of the Mackay and Lower Burdekin areas where high floods early in 1958 had caused considerable lodging with associated bending of stalks and deposition of sand and silt; these factors increased the difficulty of delivering clean cane. In the Bundaberg-Childers zone an unexpectedly large crop followed the disastrous 1957 drought, demonstrating the recuperative powers of the district soils; all areas except Gin Gin produced over-peak crops.

PROSPECTS FOR THE 1959 SEASON

If confirmation were needed of the stability in the industry, mentioned in last year's report, it is provided by the available crop for the 1959 season. It is again far in excess of peak requirements despite the effects of a very serious cyclone in the Lower Burdekin area and the warnings of limitation on the acquired sugar; these warnings were issued during the 1958 season and resulted in some reduction in fertilizer application and in acreage ratooned.

The enhanced stability of production is largely related to an improved, and progressively improving, varietal position. This applies principally in the southern and central zones where, previously, the vagaries of seasons had their greatest effects. Varietal improvement has not, in the last five years or so, been so marked in the Lower Burdekin and the far north, except for special purpose canes for the low-sunshine areas, and lodging resistant types for the very rich lands. Since specific attention is now being given to the problem areas of the far north, varietal progress there is likely to accelerate.

The Bureau's early crop estimate, made in May, 1959, assessed the available cane at 10,391,000 tons and the sugar at 1,411,500 tons 94 net titre. These figures were 1,472,000 tons of cane and 198,500 tons of 94 n.t. sugar in excess of peak requirements. It was stated, when publishing the crop estimate, that the figures were probably too optimistic, in view of the heavy arrowing which would reduce late growth and the deterioration of the crops stoodover from 1958. Subsequent events have confirmed this



Illustrating the proportion which each of the five principal varieties contributes to the total crop.

opinion. However, a considerable surplus is in sight and it is unlikely that any individual mill will manufacture less than its peak.

The early progress of the harvest has shown that sugar content in cane is higher than normal, principally due to favourable growth conditions in the early summer of 1958-59. This factor, if continued throughout the season, will result in the peak sugar figure being obtained with less tons of cane than earlier anticipated.

The expected New South Wales production for 1959 season is estimated at 528,000 tons of cane and 64,700 tons of 94 n.t. sugar.

BUREAU ACTIVITIES

The Relative Values of Old and New Varieties

Following the discovery of ratoon stunting disease, and the development of the concept that this could be a major cause of yield decline in varieties, advantage was taken of the opportunity afforded to test the relative yields of old favourites and new varietal productions. Having cleaned up any ratoon stunting disease in the old canes and ensured that it did not exist in stocks of the newer ones, yield trials were planted and the results obtained over a rotation including a plant and two ratoon crops. Three trials were conducted and, in the aggregate eight of the old varieties were compared with six present day canes of commercial importance. In each case, without exception, the newer canes proved superior in all crops.

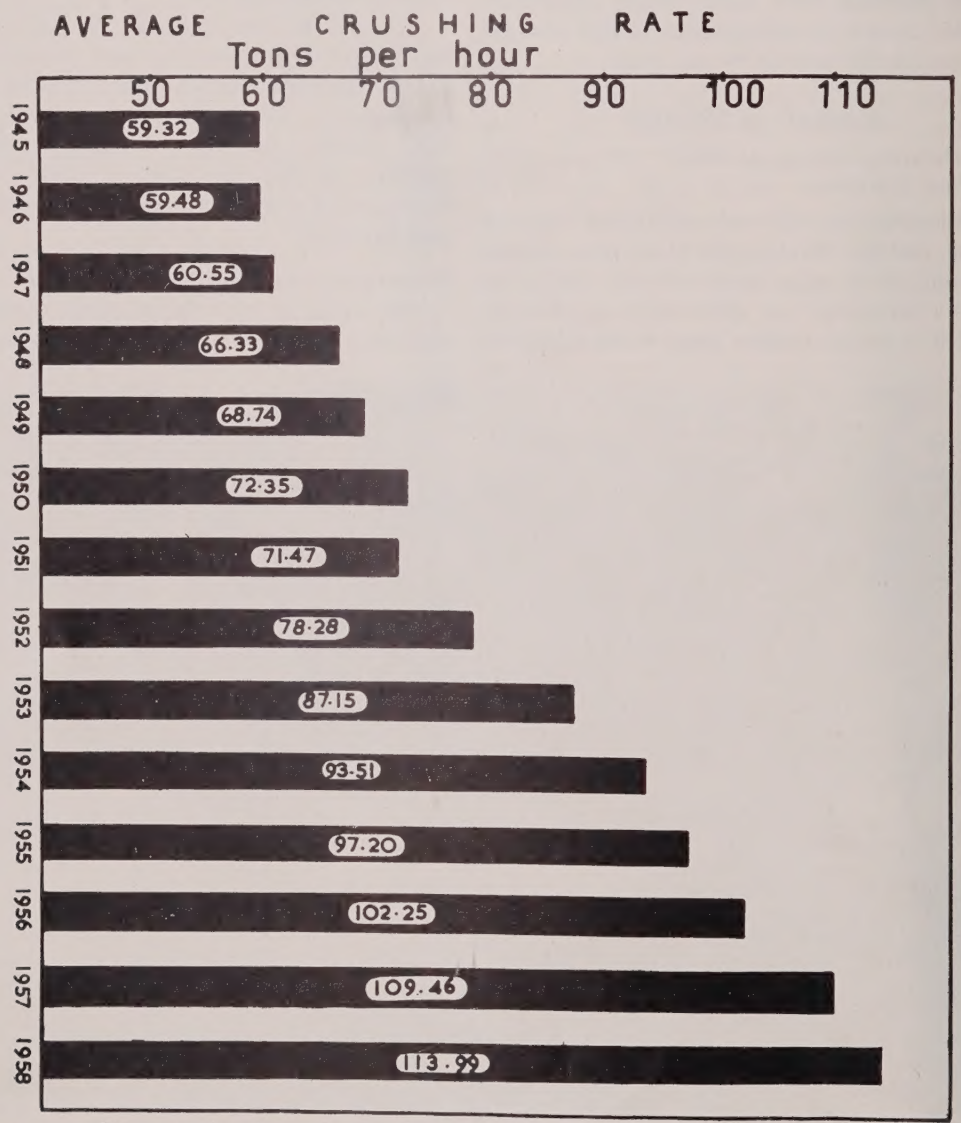
This is the first occasion, in this country, that such a comparison has been possible, under disease free conditions, and with the same growth environment. The results give assurance, if such were needed, that cane breeding results are positive, and that they have not merely retained the *status quo* against the attacks of the mysterious yield decline.

Progress of the Anti-lodging Canes

The advent of Q.57, Q.66 and Q.67, previously mentioned in these reports, was the beginning of

Illustrating the poor growth, grading into growth failure, on a saline patch on a Mackay farm.

an era of breeding varieties which can resist lodging in large crops, and under high-wind and flood conditions. Q.57 has been found, in addition, to possess the ability to produce high sugar content under the low sunlight conditions which characterise the wet belt. Its progress in such areas has been spectacular. The extension of Q.66 has been slowed down deliberately because of its susceptibility to leaf scald disease, but there is growing evidence that the danger lies in its being grown adjacent to other diseased varieties. In the absence of appreciable reservoirs of the disease in adjacent fields Q.66 appears to remain completely or relatively disease free. This may be the solution of the problem of using this valuable cane on the very rich lands for which it is admirably suited. Q.67 is finding its place on the rich lands of the Lower Burdekin delta and is extending slowly into other areas.



The average crushing rate for Queensland mills continues to increase steadily. The average excludes the four C.S.R. mills and Rocky Point.

The Climatic Range of Varieties

Queensland's lengthy sugar coastline — extending for over 1,000 miles north and south— introduces climatic divisions which would not appear to lend themselves to the use of the same varieties. Such used to be the case, and the northern, central and southern areas had groups of varieties specifically suited to the climatic conditions.

Modern hybrids appear to have a greater range of adaptability, and it would appear, on experience to date, that those selected in the central zone are more likely to be useful in the northern and southern sectors than is found in reverse. The success of Q.50 and Q.58 in both North and South Queensland and the early promise shown by Q.68 suggest that future central district canes may give a useful performance in other areas. It may be significant, however, that none of these central-district canes has found a place in the very wet belt, which appears to need larger-barrelled but less vigorous types.

New Seedling Plots

The policy of growing and selecting seedling canes in the environment in which they are to be commercialised has been extended to the districts of Tully and Childers. Within the few years that the Innisfail sub-station has been operating the selections have been of such a high standard, compared with the best commercial canes, that a degree of optimism regarding its future is justified. Although the Tully area is reasonably close, and in the same high rainfall zone, a seedling introduction plot has been established there to supplement the Innisfail work. Similarly at Childers, near Bundaberg, where few Bundaberg seedlings have succeeded, an attempt will be made to improve matters by local selection.

Limitations of staff govern the number of such sub-stations which can be operated effectively but, should experience indicate any appreciable degree of success with the new ventures, consideration must be given to an expansion of this form of work.

Soil Salinity and Cane Growth

The subject of soil salinity and its effect on crop development did not receive any attention until recent years when expansion on to some marginal lands brought certain salt affected areas to light. The worst of these occur in locations where the land elevation is only slightly above sea level, besides being in close proximity to tidal influence. These two factors combine to make adequate drainage more difficult and, with impeded drainage, the leaching of the salt will be longer delayed. Fortunately the areas involved are not large and are represented, in the main, by irregular patches in the lower parts of a number of farms. The salt concentration in the soil varies from a slightly toxic level to the stage where germination and early growth are virtually inhibited. Standards of conductivity have been established, allowing rapid and ready diagnosis of the condition, and providing reasonably pre-

This Colombo Plan fellow (right) is one of many receiving experience in the sugar industry.

cise information on the likely behavour of crops which may be planted. Varietal investigations are in train in an endeavour to select types which may possess a greater than normal tolerance to the saline soil condition.

Breeding for Two-Year Canes

A direct result of the crop restriction which fixed markets are imposing on the industry is the standing over of surplus cane crops. By and large the varieties commonly grown in Queensland are not suited to a two-year growth term. Some cognisance is being taken of this economic position in varietal selection, and two varieties suitable for two-year cropping are being distributed in the Isis area.

However, there are obvious dangers in a planned switch-over to two-year canes. The lodging problem must be accentuated, with resultant higher harvesting costs; two-year cane will provide better rat harbourages and make baiting campaigns more difficult; the beetle borer population could assume pest proportions in a short time; and mechanical harvesting would become an even greater problem than it is now.

There are many advantages inherent in the existing annual harvest procedure, and there would appear to be little to gain in a change to two-year cropping.

A New Strain of Mosaic?

The discovery of what may be a new strain of mosaic disease in part of the Mackay area is a matter of some concern. Although not yet proven by inoculation into a series of test varieties, the variation in pattern gives grounds for belief that strain mutation has occurred in this country as it has done in others. Much has been achieved in cleaning up mosaic disease in sugar cane in several of our districts and, since the discovery of this new form, a strong effort has been made fo confine it, and to eradicate it in known intected farms. The principal danger, with a new strain, is that it may prove pathogenic on a valuable variety which is resistant to the older form.

The Ratoon Stunting Disease Campaign

This has continued in a somewhat abated form. Now that virtually all growers have the bulk of their crop grown from the progeny of hot water treated stock, the aim is to ensure that there is an infusion of new, treated material every couple of years. The small percentage of " escapes " during the treatment, plus the anticipated reinfection through inadequate farm hygiene, ensures that a goodly proportion of farms will require new plant stocks periodically. A deal of investigation has been directed at improving germination following hot water treatment and the methods adopted include full-stalk treatment as opposed to " sett " treatment. Some caution is necessary to ensure that the methods employed do not improve germination at the expense of the curative effect.

Progress with Chlorotic Streak

After a lengthy period, during which virtually no progress was made in understanding this disease, Bureau pathologists achieved a major step forward by demonstrating transmission from diseased to healthy plants in water cultures. Although the initial work was not performed under insect-free conditions, the weight of evidence favours a water-inhabiting factor as being the cause of the disease or the vector for

The seedling variety L.622; one of the many being tested for performance on the rich Abergowrie flats.

its spread. More detailed investigation work is now in progress both in north and south Queensland, and the transmissions already obtained may be the necessary break-through to a better understanding of this puzzling complaint of the sugarcane plant.

The Tenth I.S.S.C.T. Congress

Listed elsewhere in this report are the titles of papers contributed to the Proceedings of this Congress by Bureau staff. Personal representation at the Congress included the Deputy Chairman of the Board and two staff members. The meeting in Hawaii afforded the opportunity to see at first hand the research work being conducted in that country and to examine the mode of attack on problems which, in many cases, are similar to those in this industry.

Hardboard from Bagasse

This project, conducted in association with Monsanto Chemicals (Aust.) Ltd., continued during the year. The bagasse resin boards produced were of good quality, and the test data obtained by the University of Queensland showed them to be comparable with commercially marketed hardboards. Board samples and test data were submitted to a group of sugar millers who form the Mackay Sugar Manufacturers Association and all available detail was supplied. The project will probably be continued, studying the production of thicker, less-dense boards suitable for corestock.

Extra Land for Cane Breeding

The obstacle to expansion of our cane breeding activities has largely been overcome by the purchase of an additional acreage adjacent to the Meringa Experiment Station. The proximity was essential in the interests of efficient operation and the land became available just in time to allow planned expansion of this activity. Although not high quality land, the area is uniform and should be suitable for the experimental work and replicated lay-outs associated with cane breeding. The main area of the Meringa Station is not suited to field experimentation because of extreme soil variability, and the growing statistical emphasis in seedling selection makes soil uniformity essential.

PUBLICATIONS BY BUREAU STAFF

To the Proceedings of the Q.S.S.C.T.

Barrie, A. G.	Some Factors Affecting the Germination of Cane after Hot Water Treatment.
Beale, R. F.	Entrainment Prevention at Gin Gin.
Moller, R. B.	Soil Conservation in Isis Area.
Skinner, S. O.	Mercurial Treatment of Cane Stalks.
Toohey, C. L.	Is Control of the Common Reed Possible ?
Vallance, L. G. and Young, H. E.	Deterioration of Cut-up Cane with Reference to Mechanical Harvesting.

To Proceedings of Tenth Congress I.S.S.C.T.

Buzacott, J. H.	Methods of Cane Breeding.
Deicke, R.	Investigations with the Wet Disintegrator for the Direct Analysis of Cane.
Hughes, C. G.	The Importation of Sugar Cane into Queensland.
King, N. J.	The Varietal Yield Decline Problem.
Skinner, J. C.	Bunch Planting Experiments.
Wilson, G.	Screening Soil Insecticides against White Grubs.

Technical Communication.

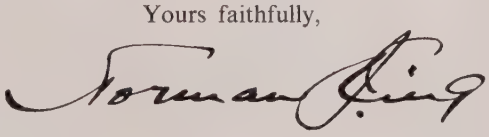
Hughes, C. G.	A Miscellany of Sugar Cane Diseases.

Several contributions were made by Mr. J. H. Buzacott and Dr. J. C. Skinner to the I.S.S.C.T. Cane Breeders' News letter and to the Australasian Plant Breeding and Genetics News letter.

Messrs. C. G. Hughes and D. R. L. Steindl have contributed several chapters to the text book on sugar cane pathology to be published under the auspices of the I.S.S.C.T.

Four issues of the Quarterly Bulletin were distributed and one issue of the News letter. The Mutual Control Synopsis and Plant Data record were issued to member mills.

Yours faithfully,



Director.

Appendix I

C.C.S. Formula

$$\text{C.c.s. in cane} = \text{Pol in cane} - \frac{\text{Soluble impurities in cane}}{2}$$

In practice, per cent. C.c.s. is calculated by the empirical formula—

$$\text{C.c.s.} = \frac{3P}{2}\left(1 - \frac{5+F}{100}\right) - \frac{B}{2}\left(1 - \frac{3+F}{100}\right)$$

where —

P = pol per cent. first expressed juice.
B = brix per cent. first expressed juice.
F = fibre per cent. cane.

Sugar Values, 1958 Season.

The final prices for the 1958 season's sugar have been declared as follows :—

——	No. 1 Pool			No. 2 Pool		Excess 5th Quota	Unassigned	Total
	Home Consumption	Surplus	Total	Excess 3rd Quota	Excess 4th Quota			
Tons ..	521,047	682,989	1,204,036	107,281	41,706	203	2	1,353,228
Per cent. ..	43.2751	56.7249	100					
Price ..	£54 15 0	£41 9 6	£47 4 5	£34 5 0	£19 0 0	10/-	10/-	£45 6 3

In addition the value for New South Wales production was :—

——	Home Consumption	Surplus	Total
Tons	36,223	22,507	58,730
Per cent.	61.6767	38.3233	100
Price	£54 15 0	£41 9 6	£49 13 3

Table A

Summary of production and consumption figures and sugar values for ten years

Year	Total Sugar Production at 94 n.t.*	Total Sugar Exported at 94 n.t.	Average Australian Price	Average Export Price	Average Price No. 1 Pool Sugar	Average Price all Sugar	Total Value
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£
1949	896,236	431,254	24 6 0	29 7 6	26 9 3	26 14 10	23,967,123
1950	879,686	395,748	24 11 0	32 16 6	28 4 1	28 5 4	24,866,084
1951	704,043	154,486	33 14 0	36 15 6	34 7 4	34 7 6	24,200,837
1952	934,226	471,008	44 3 0	41 2 0	42 14 2	42 12 3	39,809,505
1953	1,220,025	730,566	47 18 6	38 13 9	43 8 3	42 7 11	51,721,505
1954	1,300,842	784,449	47 1 0	37 8 0	42 9 11	41 4 7	53,635,071
1955	1,135,341	624,527	46 18 0	38 11 6	42 14 2	42 6 5	48,047,797
1956	1,171,518	673,751	53 11 6	41 6 5	47 1 9	46 10 6	54,506,608
1957	1,255,911	740,555	54 3 0	45 16 8	49 17 2	49 5 0	61,849,607
1958	1,353,228	832,181	54 15 0	39 8 2	47 4 5	45 6 3	61,321,200

* Excluding Local Sales.

Table I

Sugar Cane Harvested, 1958 — Estimated, 1959

Domestic Tonnages	Actual Tonnages		Mills	Estimated, 1959 (May estimate)
	Accepted	Condemned		
254,389	254,389	..	Mossman	252,500
376,573	376,573	18	Hambledon	360,000
393,665	393,665	29	Mulgrave	360,000
361,207	361,207	..	Babinda	373,400
274,982	274,982	8	Goondi	293,000
262,896	262,896	32	Mourilyan	265,000
404,663	404,663	..	South Johnstone	418,000
423,756	423,756	..	Tully	424,000
720,296	728,027	105	Victoria	744,000
410,217	402,486	41	Macknade	414,000
3,882,644	3,882,644	233		3,903,900
195,570	195,570	..	Invicta	216,850
367,845	367,845	14	Pioneer	362,230
375,941	375,941	11	Kalamia	340,000
447,913	447,913	60	Inkerman	439,200
1,387,269	1,387,269	85		1,358,280
376,815	376,815	3	Proserpine	420,000
367,899	367,909	3	Farleigh	380,000
357,719	357,701	61	Racecourse	440,000
362,887	363,074	..	Pleystowe	360,000
354,651	354,452	..	Marian	400,000
177,265	177,285	37	Cattle Creek	205,000
209,035	209,035	9	North Eton	240,000
356,763	356,763	..	Plane Creek	380,000
2,563,034	2,563,034	113		2,825,000
330,075	330,075	95	Fairymead	357,000
153,542	153,542	..	Qunaba	160,000
311,260	311,260	44	Millaquin	380,000
318,564	318,573	27	Bingera	380,000
90,254	90,245	24	Gin Gin	160,000
308,044	308,044	70	Isis	380,000
176,117	176,117	..	Maryborough	200,000
170,555	170,555	8	Moreton	206,275
49,437	49,437	..	Rocky Point	81,000
1,907,848	1,907,848	268		2,304,275
9,740,795	9,740,795	699		10,391,455

Table II

Sugar Production (94 Net Titre), 1953-1958

Districts	1953	1954	1955	1956	1957	1958
North of Townsville	467,716	502,276	413,853	406,172	516,345	540,476
South of Townsville	752,667	789,969	721,822	765,698	739,926	813,067
Totals*	1,220,383	1,301,245	1,135,675	1,171,870	1,256,271	1,353,543

* Local Sales included.

Table III
Classes of Cane Harvested, 1958

Districts	Plant Cane		Ratoons		Standover		Total Acres
	Acres	%	Acres	%	Acres	%	
Northern	42,029	30.4	96,274	69.6	38	..	138,341
Burdekin	21,110	58.4	15,006	41.5	30	0.1	36,146
Mackay	49,575	48.2	53,233	51.8	17	..	102,825
Southern	25,044	31.7	38,073	48.3	15,781	20.0	78,898
Whole State ..	137,758	38.7	202,586	56.9	15,866	4.4	356,210

Table IV
Total and Average Yields by Districts, 1958

Districts	Tons of Cane	Tons Cane per Acre	Tons 94 N.T. Sugar per Acre
Mossman-Ingham	3,882,644	28.07	3.91
Lower Burdekin	1,387,269	38.38	5.67
Proserpine	376,815	23.42	3.23
Mackay	2,186,219	25.20	2.99
Bundaberg-Gin Gin	1,203,695	25.24	3.33
Childers-Maryborough	484,161	20.72	2.62
Nambour-Beenleigh	219,992	28.09	3.72
Whole State	9,740,795	27.35	3.80

Table V
Acres Cultivated and Harvested, Yields of Cane and Sugar, Acre Yields and Quality of Cane, 1949-1958

Year	Acres* Cultivated	Acres Harvested for Milling	Total Yields		Yields per Acre		Tons Cane per ton Sugar
			Cane	Sugar †	Cane	Sugar	
1949	395,660	275,313	6,518,021	897,267	23.67	3.26	7.26
1950	381,545	257,562	6,691,706	879,844	25.98	3.42	7.61
1951	388,348	273,371	5,005,172	704,342	18.31	2.58	7.11
1952	419,834	274,757	6,841,536	934,614	24.90	3.40	7.32
1953	466,484	332,703	8,751,063	1,220,383	26.30	3.67	7.17
1954	486,741	367,640	9,864,305	1,301,245	26.83	3.54	7.58
1955	482,145	365,252	8,616,163	1,135,675	23.59	3.11	7.59
1956	480,116	360,932	8,978,081	1,171,870	24.87	3.25	7.66
1957	485,355	364,985	8,945,617	1,256,271	24.51	3.44	7.12
1958	487,862	356,210	9,740,795	1,353,543	27.35	3.80	7.20
Averages ..	..	322,873	7,995,246	1,085,505	24.76	3.36	7.37

* Supplied by Government Statistician. † Includes Local Sales.

Table VI
*** Details of Molasses Disposals for Periods 1949-1958**

Usage	Tons of Molasses									
	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Distilleries	115,376	99,940	79,063	99,410	154,152	153,212	151,349	159,733	128,487	159,290
Fertilizer	49,293	36,446	34,529	47,260	75,781	69,446	70,691	60,841	68,001	66,637
Stock Feed ..	36,479	36,621	37,151	37,099	36,263	38,046	35,127	36,699	30,385	39,937
Mill Fuel	9,771	15,556	6,327	5,882	1,211	7,140	10,095	9,315	1,774	736
Ferment	3,561	3,582	2,033	2,532	3,196	2,779	2,727	2,871	2,411	2,828
Other Purposes ..	1,204	231	9	151	217	352	1,179	595	762	531
Wasted	1,858	325	235	482	1,111	1,544	1,232	341	1,778	703
Totals	217,542	192,701	159,347	192,816	271,931	272,519	272,400	270,395	233,598	270,662

* Supplied by Government Statistician.

Table B

Table of Mill Peaks (Tons of 94 n.t. Sugar)

Mill	1929	1939	1949†	1950†	1952	1953	1954	1957	1958	1959
Mossman	14,972	20,000	22,000	22,000	24,000	31,000	31,000	31,000	31,000	31,000
H'bledon	31,836	36,000	39,600	39,600	41,000	44,000	44,000	47,500	47,500	47,500
Mulgrave	31,643	36,000	40,100	40,100	40,500	47,500	47,500	47,500	47,500	47,500
Babinda	31,901	36,000	39,600	39,600	42,500	46,000	46,400	46,400	46,400	46,400
Goondi	27,034	29,500	32,400	32,400	34,500	38,000	38,000	38,000	38,000	38,000
Mourilyan	23,630	27,000	29,700	29,700	31,000	34,000	34,000	34,000	34,000	34,000
Sth J'stone	30,979	36,000	39,600	39,600	42,500	47,000	47,000	49,000	49,000	49,000
Tully	30,930	38,000	42,100	42,100	45,000	47,000	47,000	50,000	50,000	50,000
Victoria	32,221	37,500	43,600	49,100	52,000	78,000	82,000	84,000	84,000	**90,000
Macknade	30,952	34,000	39,900	46,500	48,500	52,000	52,000	52,000	52,000	52,000
Invicta	11,736	16,000	18,300	19,100	20,500	30,000	30,000	30,000	‖27,000	27,000
Pioneer	21,391	26,000	30,100	34,000	35,500	45,000	45,000	47,000	47,000	47,000
Kalamia	26,053	31,000	35,400	35,600	38,000	48,000	48,000	49,000	49,000	49,000
Inkerman	*24,207	31,000	36,800	42,000	45,000	55,000	55,000	57,500	57,500	58,700
Proserpine	16,650	23,000	26,300	33,000	35,000	43,000	43,000	45,000	45,000	45,000
Farleigh	16,993	23,000	27,600	32,400	33,500	42,000	42,000	44,000	44,000	44,000
R'course	18,066	24,000	29,000	35,200	36,500	42,000	42,000	44,000	44,000	44,000
Pleystowe	19,871	24,000	29,200	35,900	37,000	45,000	45,000	45,000	45,000	45,000
Marian	18,997	24,000	28,600	32,300	33,500	42,000	42,000	42,000	42,000	42,000
Cattle Ck.	8,791	12,000	13,400	14,100	14,500	20,000	20,000	21,000	21,000	23,400
Nth. Eton	9,319	12,000	14,500	15,900	17,500	26,000	26,000	26,000	26,000	26,000
Plane Ck.	18,233	24,000	28,600	30,800	32,500	42,000	42,000	44,000	44,000	44,000
Fairymead	15,882	21,000	25,700	28,600	29,500	37,000	37,500	37,500	37,500	37,500
Qunaba	8,940	10,000	11,200	12,700	13,500	15,500	§16,500	19,500	19,500	19,500
Millaquin	14,443	19,000	24,100	29,600	31,000	35,000	§39,000	37,000	37,000	37,000
Bingera	17,864	23,000	27,800	31,000	31,500	37,000	37,000	39,000	39,000	39,000
Gin Gin	6,000	6,500	8,000	8,400	9,000	12,500	13,000	14,500	14,500	14,500
Isis	28,011	27,000	30,000	30,200	31,500	33,000	35,000	37,500	37,500	39,500
M'borough	3,862	7,500	9,500	9,500	‡17,300	14,500	20,000	20,000	20,000	20,000
Mt. Bauple	6,231	6,500	7,200	7,200	..	..	..	..	..	..
Moreton	11,586	14,000	16,000	16,000	16,500	20,000	20,000	20,000	20,000	20,000
Eagleby	280	300	..	..	..	..	..	..	..	..
Rocky Pt.	2,014	2,200	2,700	2,700	2,780	3,500	4,000	5,000	5,500	5,500
	611,428	737,000	848,600	916,900	963,080	1,152,500	1,170,900	1,203,900	1,207,400	1,213,000

* Increased by 2,500 tons in 1938.
† Does not include 3 per cent. for Soldiers' Settlement.
‡ Includes 4,800 tons for Mt. Bauple.
§ As from 1955 season 2,000 tons peak was transferred from Millaquin to Qunaba.
** Peak of 6,000 tons 94 n.t. sugar transferred from Invicta.
‖ Balance of Invicta peak increased by 3,000 tons.

Progeny of one of the new legume crosses. The seed is being purified through a number of generations.

Division of Soils and Agronomy

L. G. Vallance, Assistant Director

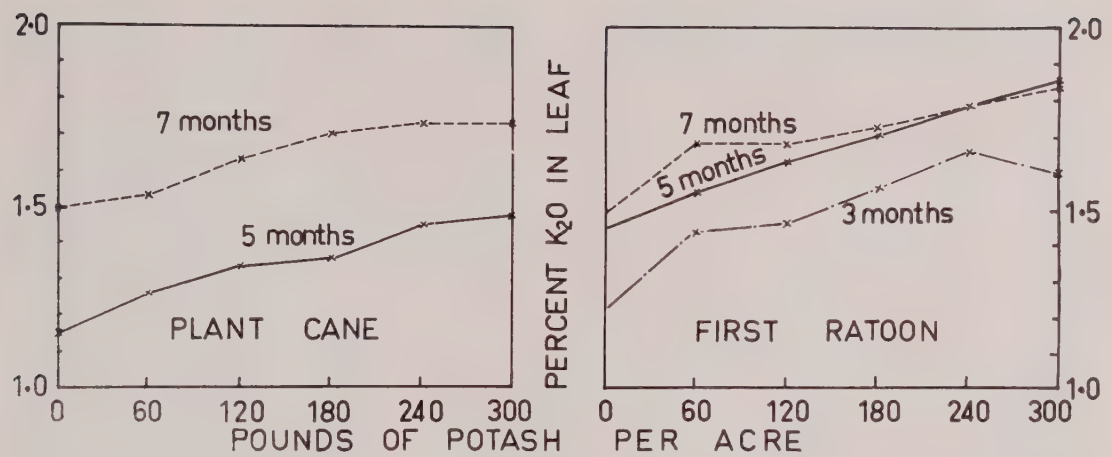
Potash Nutrition Studies

The series of trials designed to investigate the potash requirements of the cane plant was continued. In these studies the effect of soil potash, and potash applied as fertilizer, on yield response and uptake by the plant is being studied. The amounts used were : nil, 60, 120, 180, 240 and 300 lb. of potassium chloride per acre. Eight plant crops of these randomised trials were harvested in the Cairns, Innisfail, Mackay, Bundaberg and Nambour areas. Seven of these have been ratooned for further study and four more were planted during the year.

Statistically significant responses due to potash were obtained in two of the trials while three others also gave strong indications of improved yields. The remainder showed no response. The soil analyses have so far shown that there was a general build up of available potash during the fallow period prior to sampling, and that a marked depletion of this nutrient took place during the growth of the crop. This latter effect occurred irrespective of the amounts of applied potash. Because of the lowered potash status of the soil at the end of the plant crop, a greater response to treatment is anticipated in the ratoons.

Several hundred leaf analyses (third leaf) have been carried out, but to date it is difficult to detect any well defined relationship between these and potash response. For example, a trial at Cairns showed a significant response to potash with a leaf content of 1.7 per cent. K_2O, whereas at Nambour no sign of a response was obtained although the leaf content was less than one per cent. (0.92).

As might be expected the potash content of the leaf rose with increasing applications of fertilizer. Although the K_2O contents of equivalent leaves varied considerably from trial to trial the mean values for all trials have been calcu-



Using the third leaf as an indicator the above graphs show that the K_2O content of the plant increased, not only with increasing applications of potash, but also with the age of the plant. This was true for both plant and ratoon cane.

lated and, since these clearly show the general trend, they are given in the accompanying graph. A rather noticeable feature is the rate at which the potash content of the plant increased with age. This was true for the cane which received no potash and also for that which received the various applications. The graphs of the samples taken three and seven months after planting show this very well. This would imply that the selection of indicator levels for foliar diagnosis involves age recognition and, if physiological age is the important factor in this respect, there are obvious difficulties in the practical utilization of leaf analysis for the determination of nutritional requirements under Queensland conditions.

The right hand graph shows the mean K_2O content of the leaf (third) when the first ratoons were three, five and seven months old. The trends are similar to those of the plant cane and the correlation with yields will be of interest after harvest.

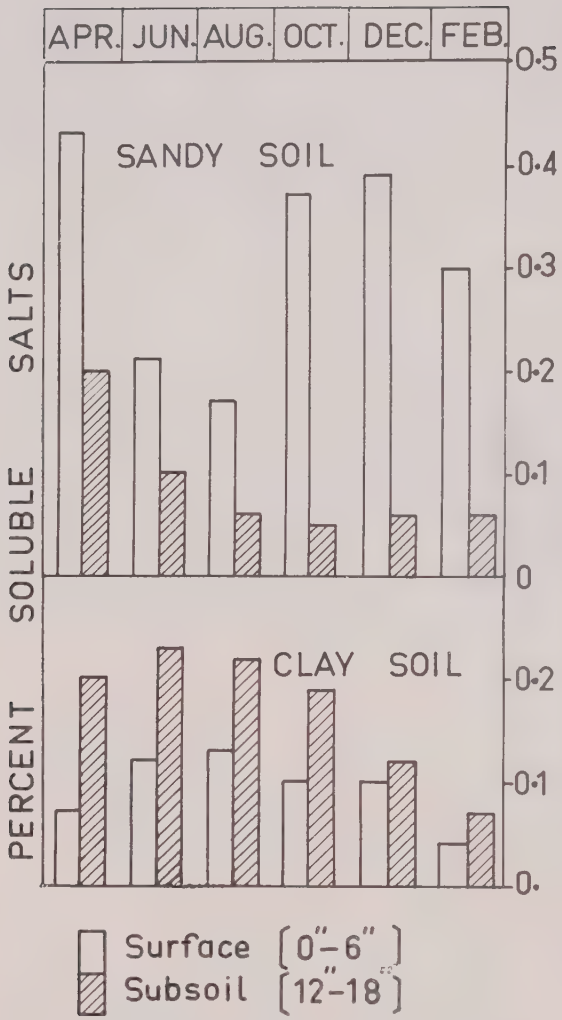
Fertilizer Trials

Nitrogen—Phosphoric Acid—Potash

The second ratoon crop of the second cycle of a fertilizer trial was harvested at South Johnstone. This trial, which was first planted in 1951, was designed to demonstrate that the tendency to use heavy dressings of fertilizer which has been apparent in some parts of North Queensland in the past few years is uneconomic. The amounts used in the trial varied from 6 to 12 cwt. of six combinations of Sugar Bureau Mixture No. 2 and sulphate of ammonia. The results of the six crops showed that 4 cwt. of mixture plus a top dressing of 4 cwt. of sulphate of ammonia was adequate for the crop requirements and a monetary loss was obtained by increasing the fertilizer applications beyond that level.

Amongst the routine trials carried out for extension and advisory purposes was a split application-top dressing trial on an irrigated property at Home Hill. Sulphate of ammonia was used, and this was applied in (a) one single application, (b) two equal applications, and (c) three equal applications. These treatments were repeated at different levels of nitrogen (2, 4 and 6 cwt. sulphate of ammonia per acre). At no time during the growth of the crop did it appear that any advantage was to be gained by the extra operations involved in dividing the top dressing. This was reflected in the yields of both cane and sugar, neither of which showed significant differences.

A trial of interest at Mackay showed that a green manure crop (cowpea-velvet bean mixture), turned in prior to planting, could supply all the nitrogen required for the plant crop on this particular soil type. The plots on which no green



Seasonal fluctuation of soluble salts in some poorly drained soils. Note the surface concentration in the sandy soil, contrasted with the subsoil concentration in the clay soil.

manure was grown responded very well to top-dressing with sulphate of ammonia but no response was obtained where the legume had been ploughed in. The yields of the control plots which had no green manure and no sulphate of ammonia were significantly below those of all other treatments.

The first ratoon crop of an N.P.K. trial on a forest soil at Alloway showed a highly significant response to nitrogen, but no other treatment differences were detectable.

Suspected Magnesium Deficiency

In parts of the Mossman and Babinda districts symptoms were observed in young cane similar to those which are generally ascribed to calcium and magnesium deficiency. Depressed growth was very obvious, and a reddish-brown speckled appearance was characteristic on all leaves except the youngest and partially unrolled. The field, instead of the usual healthy green, had a marked rusty appearance. There was also some varietal difference, in that Q.57 usually suffered more than Pindar.

A skirmish trial was set out using several materials in various combinations, including lime and magnesia, both separately and together. Some months later the symptoms still persisted although the cane receiving magnesia had made better growth than the others. Leaf analyses showed a content of .09 per cent. MgO which increased to .12 per cent. after treatment. Plots receiving lime alone increased from .26 per cent. CaO to .35 per cent. in leaf content. Where lime and magnesia were applied in combination the increase in leaf Ca was similar to that of lime alone, but apparently Mg uptake was restricted since no increase in the leaf could be detected.

Poor Growth Studies—Nematode Investigations

Species Present

The occurrence of parasitic nematodes in large numbers in association with the sporadic occurrence of poor growth, poor ratooning and poor germination patches, which could not be explained by fertility, disease or other usual factors, led to an investigation of the role which nematodes might be playing in this problem. In general, higher populations of parasitic species were found in, and adjacent to, the affected sites, than in areas of normal growth. The species of nematodes most commonly found were Pratylenchus zeae, Pratylenchus brachyurus, Helicotylenchus nannus, Xiphinema pratensis, Tylenchorhynchus martini, Trichordorus christei, Trichodorus minor,

Criconemoides rusticum, Radopholus rusticum, Trophurus sp. and Meloidogyne sp. Other species of Helicotylenchus, Criconema and Xiphinema were occasionally present. In most instances P.zeae, T.martini, X.pratensis, H. nannus and Meloidogyne sp. were the commonest organisms, it being not unusual to find all five species associated in the one infestation. In all cases typical damage was found on the cane roots.

Soil Fumigation Trials

Exploratory soil fumigation trials using standard nematicides were set out with the object of assessing the effect on production which the nematodes might be causing. The fumigants used were EDB, DD, and nemagon. The applications were made as both row and broadcast treatments and at varying dosage rates. Nemagon was applied as a post-plant, pre-plant and ratoon treatment, whilst EDB and DD were used as pre-planting applications.

Observations in the Bundaberg district on a trial with well advanced plant cane were of interest. The cane was heavily infested with root knot nematodes at the time of treatment with nemagon, and the fumigant was applied at 5 g.p.a. and 2.5 g.p.a. Four months after treatment only an occasional new root knot had appeared in the 5 g.p.a. plots whilst numerous knots had appeared in the 2.5 g.p.a. and untreated plots. Population counts of parasitic nematodes in the soil in the 5, 2.5 and 0 g.p.a. treatments were in the ratio 250: 2410: 8680 nematodes per 500 grams of soil. It would appear from this, and the relative numbers of root knots occurring, that the 5 g.p.a. dosage was sufficient to control the egg laying of the eelworms in the knots, or to persist long enough to kill the larvae as they hatched, whilst the 2.5 g.p.a. dose was insufficient to do this as effectively. Soil popu-

Q.63 on potash-deficient soil. The much better cane on the right covers the strip where tops from the previous crop were raked and burned.

Early germination in a soil fumigation trial. Rows on right received a pre-planting treatment with 20 gal. per acre of D.D.; those on the left are the control.

lation counts from all plots indicated that *Xiphinema pratensis* was more resistant to nemagon than the other species encountered.

Trials at Pinnacle in the Mackay district showed that DD treatment at 20 g.p.a. prior to planting resulted in an estimated crop increase of some 10 tons per acre. EDB at the same rate gave an intermediate result. Quicker germination occurred in all treatments than in the untreated plots. On ratoon cane at the same place a similar estimate of 10 tons per acre increase was obtained by fumigating with nemagon at 2.5 g.p.a.

At Mackay also a trial set out on a ratoon field produced similar results with nemagon at 2.5 g.p.a. This treatment proved much superior to 1.25 g.p.a. nemagon. Granular nemagon produced an equivalent response to the liquid form at an equivalent dosage. The weight of cane per acre at harvest due to the treatments was : Nemagon at 1.25 g.p.a. = 19.10 tons, nemagon at 2.5 g.p.a. = 22.2 tons, untreated control 13.15 tons.

Periodic eelworm counts made on samples from trial areas after fumigation showed a gradual recovery in population over the period. Ten months after fumigation the population of the EDB plots had risen to one-fifteenth of the numbers in the control plots, whilst in the case of DD the population had risen to one fifth of that in the control plots. Despite this the DD treatment resulted in the greater cane yield.

On the Lower Burdekin a trial comparing DD and EDB at 25 g.p.a. resulted in an estimated gain of 10-15 tons per acre, with the DD again producing the greatest response. Nemagon at 2.5 g.p.a. on ratoon cane also effected a good response. The DD and EDB treatments again resulted in quicker germination.

At Babinda a trial using nemagon at 1.25, 2.5 and 5 g.p.a. as both row and broadcast treatments was set out in young plant cane. There was no apparent difference in result between row and broadcast treatment at the same rates, and all dosage rates caused a development of intense green colour in the foliage. The 2.5 g.p.a. produced an estimated increase in crop of 15 tons per acre whilst the 1.25 g.p.a. rate gave less response. There was no difference in response between the 2.5 and 5 g.p.a. treatments.

Soil Conservation

A good deal of assistance was given to growers, particularly in the southern districts, in the establishing of soil erosion control measures. Contour lines were surveyed on 17 farms in the Isis, Gin Gin and Maryborough areas. In general the nature of this work falls into two categories (a) close adherence to contour lines and (b) establishment of guidelines which, under certain conditions, will depart from the true contour. In the former, contoured banks or shallow water furrows are formed at intervals of 70 feet to 90 feet depending upon the slope, and this allows one tram width for harvesting purposes between banks. Experience has shown that in many of the red soils of the Isis district a fall of 2 feet per 100 feet can be allowed in these channels and in the cane rows which are planted parallel to them. Originally, falls of less than one per cent. were used; these were inadequate and much silting and break through occurred. The guideline system is gaining popularity. In effect this is a system of parallel planting which follows the contour for most of the field but, where necessary, will depart from it in order to avoid short or point rows. Because a two per cent. slope is possible, the guideline is appropriate for many areas, but difficulties are encountered in fields where the topography is of considerable irregularity.

Improved root development following soil fumigant treatment. The stool on the right is from the area treated with 2.5 gal. per acre of nemagon and that on the left from the control.

One of the shading trials designed to measure the effect of reduced light on growth and sugar content.

Deterioration of Cut-up Cane

In view of the promise shown by the Massey-Ferguson cane harvester it was considered advisable to investigate the possibility of sugar losses from the cut-up sections of the cane stalks which occur as a result of the technique employed by this machine. An extensive series of trials was therefore carried out at each of the four experiment stations and these were designed to measure the deterioration of stalks cut into sections, approximately one foot in length, in comparison with that of the whole stalk as obtained in the normal method of harvesting. These comparisons were made in the early, middle and late parts of the crushing seasons, and the three major varieties in each of the four areas were used. These were:—Q.50, Q.57, Q.58, Badila, Trojan, Pindar, CP29/116 and N.Co.310.

In all, over 5,000 weighings and c.c.s. analyses were made and the weight and c.c.s. losses were calculated for all districts, periods and varieties at two days and four days after harvesting.

Weight Losses

The cut-up cane lost weight at a slightly greater rate than whole stalk, and this occurred both at the two day and four day intervals after harvesting for all districts, varieties and crushing periods. The figures in the accompanying table show that within two days after harvest the cut-up cane had dropped in the overall average to 96.5 per cent. of its original weight, whereas the whole stalk had dropped only to 97.5 per cent.; at 4 days the respective figures were 94.5 and 95.3 per cent. These differences were not very great but they were statistically significant, and give a fair measure of the average difference between

the two types of cane. Variations in the rate of loss occurred in all samples according to weather conditions, but these affected both cut-up and whole cane in a similar fashion. Varieties or period of harvest (early, middle or late season) had no detectable effect on the rate of loss.

WEIGHT (Averages for districts).

District	After two days			After four days		
	Cut-up	Whole	Excess of whole over Cut-up	Cut-up	Whole	Excess of whole over cut-up
Gordonvale	97.5	98.1	0.6	95.9	96.5	0.6
Burdekin	96.5	97.3	0.8	94.6	95.9	1.3
Mackay	96.8	97.7	0.9	95.1	95.1	0.0
Bundaberg	95.1	96.8	1.7	92.4	93.6	1.2
Overall average.. ..	96.5	97.5	1.0	94.5	95.3	0.8

Weight (expressed as percentage of the original) of the cut-up and whole cane after two and four days.

C.c.s. Losses

As shown in the accompanying table the losses in c.c.s. followed much the same pattern as weight losses. The cut-up cane lost sugar at a slightly greater rate than the whole stalk. The average figures give a reasonable picture of what occurred and they show that two days after harvest the sugar content of the cut-up cane had dropped to 98.0 per cent. of the original whereas the whole stalk had decreased only to 99.2 per cent. As the table shows, this difference was greater after four days.

C.C.S. (Averages for districts).

District	After two days			After four days		
	Cut-up	Whole	Excess of whole over cut-up	Cut-up	Whole	Excess of whole over cut-up
Gordonvale	98.4	98.7	0.3	97.0	98.2	1.2
Burdekin	97.7	97.8	0.1	96.0	97.7	1.7
Mackay	98.0	99.4	1.4	95.6	98.6	3.0
Bundaberg	98.1	101.1	3.0	94.9	98.8	3.9
Overall average.. ..	98.0	99.2	1.2	95.9	98.3	2.4

C.c.s. values calculated as percentages of the initial c.c.s. content.

The results of this work suggest that this method of harvesting might, in the normal elapsed time from harvesting to milling, be responsible for loss of c.c.s. of the order of one per cent. i.e., one ton of c.c.s. for each 700 or 800 tons of cane. In round figures this could be estimated as a little less than 1/- per ton of cane, which is considerably less than the anticipated reduction in harvesting costs if the machine proves successful. There were indications that the effect of weather conditions on some varieties could be important. (This work is described in full detail in the 1959 Proceedings of the Queensland Society of Sugar Cane Technologists).

A germination trial, using hot water treated cane buds, is conducted under controlled temperature conditions.

Weed Control

Northern Districts

The giant sensitive plant (*mimosa invisa*) continues to provide a serious threat to cane lands in the Innisfail area. Dense germination in the declared seed beds, and many new infestations, require the continuation of active control measures. The Department of Public Lands has made a grant of £50,000 for the purchase of vehicles, spray equipment, weedicides, the provision of adequate labour, etc., and a vigorous co-operative effort by all the various organisations concerned is now underway to combat the pest. Notwithstanding this it appears that cane growing may have to cease on at least one property in order to allow drastically intensified eradication methods to be attempted.

At Tully, dalapon is proving useful on tramlines and in drainage channels. It has been shown that growth of guinea and para grasses can be sufficiently depressed to provide satisfactory control for all practical purposes; complete eradication is not aimed at, nor is it altogether desirable. An infestation of *centrosema pubescens* which had got out of hand on a Freshwater field was satisfactorily eradicated with 2,4,5-T.

Lower Burdekin

In this area some time was given to investigating the possibility of developing a suitable method of weed control in irrigation channels. Six trials were established and the two combinations of chemical which are giving the most promising results to date are: (1) P.C.P. ($3\frac{1}{5}$ gallons per acre) plus T.C.A. (35 lb. per acre), and (2) dalapon (10 lb. per acre) plus 2,4-D (4 lb. per acre). For light weed growth these rates could probably be reduced, but it was observed that the results were not entirely satisfactory where weed growth was very rank. In

this work it is necessary to keep the costs of the treatments below the equivalent of £15 per acre, otherwise these channels can be kept clean more economically by mechanical means.

Dalapon is also being used to eradicate an infestation of Johnson grass recently discovered on several farms and the roadsides of the Anabranch road. A satisfactory control appears to be possible, and repeated sprayings with dalapon at concentrations of 10 lb. per acre are in progress.

Mackay District

Trial sprayings with 2,4-D, methoxone and 2,4,5-T were made to evolve a satisfactory control of gambia pea in standing cane, particularly in fields of Q.63 whose upright top gives only poor cover and little check to these weeds. The first two weedicides had no effect, but 2,4,5-T gave very good results and, at the rate of one-half pound of acid equivalent per acre, satisfactory control was obtained. Blue top (*ageratum conyzoides*) also proved susceptible to this application, and since these two weeds combine at harvest time to form a considerable nuisance, inter-row spraying with 2,4,5-T could be carried out with advantage in such areas.

Southern Districts

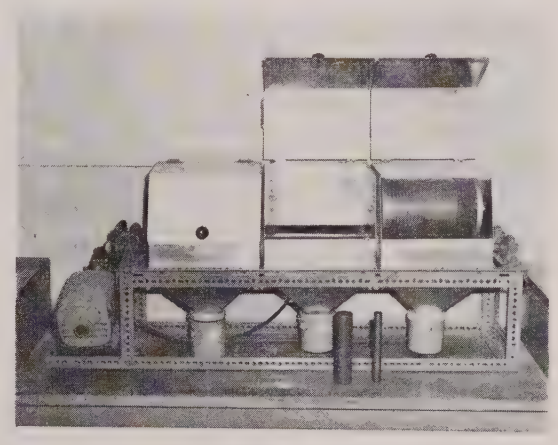
Although fairly widely utilised at one time in the southern districts the use of weedicides for pre-emergence weed control has lapsed to the state where only a few growers employ the practice. Nevertheless interest is still alive and a reliable material cheaper than 2,4-D would be welcomed. Demonstrations of the use of dalapon against reed grass aroused much interest among growers in several areas and, at Fairymead, good results have been obtained in drains with this material in combination with TCA and oil emulsions. The use of dalapon in standing cane requires caution since severe stunting was observed where an application of 15 lb. per acre had been made.

The problem of turnsole (*heliotropium amplexicaule*) eradication was again given attention. Dalapon, polyborchlorate and 2,4,5-T were used, and spring, summer and autumn applications were made. Results showed that the latter has the most promise and that sprayings made during the autumn gave a kill superior to either spring or summer applications.

Hot Water Treatment and Germination

Trials were conducted at Meringa to determine the influence of various factors on the germination of cane subjected to hot water treatment. The most important fact to emerge was that the resistance to damage by the long hot water treatment (l.w.h.t. = 50°C for 3 hours) increased from June to September. Expressing the germination in l.w.h.t. plots as a percentage of the controls the germination was 4 per cent. if planted in June, 42 per cent. if planted in August and 87 per cent. when planted in September.

Other factors investigated were:—plant versus ratoon; arrowed versus non arrowed cane; Trojan versus Q.50; tops versus butts; outside rows versus inside rows; effect of pre-fertilizing. A number of significant effects and interactions were obtained. No consistent differences were found between plant and ratoon cane for the early season trials, but setts from plant cane were significantly better than those from ratoon in September both



A machine for soil preparation. Soils for analysis are air dried, and then ground and sieved to a 2 mm. fineness in this apparatus. Three soils may be prepared simultaneously. Both manual effort and the dust problem are eliminated.

for treated and untreated cane. Hot water treated cane from outside rows gave better germination than that from inside rows, but this did not apply to the untreated cane.

In June, butts were better than tops in the h.w.t. plots but the reverse was the case in the untreated cane. In August tops were significantly better than butts for both treated and untreated and this also occurred in the September trials. Hence, tops should be regarded as susceptible to h.w.t. early in the season.

There was no difference between arrowed and non-arrowed h.w.t. cane in June but as the season progressed the setts from non-arrowed cane gave significantly better germination; this was mainly due to the vastly superior behaviour of the non-arrowed tops. It was also found that the application of either sulphate of ammonia or a mixed fertilizer (10-5-15) applied four to eight weeks prior to cutting the cane significantly improved the germination of the plants. This was more marked in the untreated than in the hot water treated plots. The effect however was small, and commercially is probably not worthwhile. Cane for plants was also taken from two fertilizer trials in which various levels of N.P.K. had been used, but no general pattern of increased germination with increased amounts of fertilizer was obtained.

These trials represent a considerable amount of work extending over several years and more detailed information is available in the paper "Some Factors Affecting the Germination of Cane After Hot Water Treatment" by A. G. Barrie (Proceedings Queensland Society Sugar Cane Technologists, 1959).

Some Miscellaneous Studies At Meringa

Because of the importance of quality gradings in seedling selection, further observations were made on brix—c.c.s. relationships. Again the three point stab method showed a slightly closer correlation of brix and c.c.s. than did the one point method. Some tests were also carried out on the differences between pairs of operators and it was found that this was slightly more marked in the single than in the three point stab.

Some measurements were made on the density of cane stalks. Varietal differences were not very great and, as might be expected, the major difference occurred in the comparison of arrowed and non-arrowed cane. A shading trial is at present in progress to determine the effect of 25 per cent. shading on sugar content. Frames carrying aluminium slats were placed over cane about six feet high in February, but to date there are no obvious differences in growth.

Analytical Work

The Brisbane and Mackay laboratories analysed 2,856 soil samples during the year, of which 756 were handled at the latter centre. A large number of the samples were from experimental plots and the number of farmers samples received for fertilizer recommendation was below that of last year; these amounted to 790 at Brisbane and 425 at Mackay. There were two reasons for this drop. Due to the change over at Brisbane the intake of samples had to be slowed down for a period of about six weeks, but the major cause was the lessened interest in fertilizer usage on the part of many growers due to over production. It is to be hoped that this attitude does not continue since, with a lower output per farm, there seems even greater need for increased fertilizer efficiency and economy.

In general the emphasis was on potash deficiency rather than that of phosphate, except at Mackay where most of the samples were fairly low in both of these plant foods. Other analyses include 547 leaf samples and 528 salinity determinations from the soil reclamation work at Bundaberg.

Saline Soils

Toxic salt concentrations were found in a number of soils examined during the year. Most of these were from recently developed assignments near Bundaberg on which investigations into crop failures on the more low lying portions had been commenced in 1957. Regular profile samplings to a depth of three feet were carried out at selected sites to determine whether the extension of the original drainage installations

was improving the rate of water movement and effectively reducing salt accumulation. While there were marked changes in salinity with seasonal conditions the results of the analyses have not, as yet, indicated any general improvement. The accompanying figure illustrates the seasonal variation in soluble salts in the 0-6″ and 12″-18″ horizons of two of the soil types. It is noticeable that whereas in the sandy soils the major saline accumulation occurs in the surface horizon, subsoil salinity is more important in the heavier soil.

Seasonal Fluctuation in N Content of Southern Molasses

Weekly samples of final molasses were taken from a southern mill from August to December. As with previous samples collected during the 1957 season the nitrogen content showed a regular increase until mid-October after which it declined steadily towards the end of the season. At the commencement of the season the N content was 0.5 per cent.; it rose to nearly 0.9 per cent. and then dropped back to 0.6 per cent. in December. This behaviour closely paralleled the rise and fall in the c.c.s. content of the cane and would appear therefore to be linked with maturity or some similar growth characteristic.

On the other hand, the regular phosphate and potash estimations which were also carried out showed no sign of comparable trends. The variations which occurred were probably related to the sources from which the cane was drawn.

Potash determinations in soils by means of the flame photometer.

One of the early stages of seedling selection is the 4-sett plots. These must be hand planted.

Northern Sugar Experiment Station

G. Bates, Officer in Charge

Weather and Crop Notes

Rainfall for the year ending June 30th, 1959 was 82.83 inches which was somewhat above the average of 75.08 inches. Soil conditions in July, at the commencement of the 1958-59 growing season, were dry and the rainfall for July-October inclusive was 121 points compared with the average of 460. Average rainfall fell in November, but December was again dry. This dry weather caused a check in growth of young plant and ratoon crops, but it was ideal for harvesting. There was a spell of very hot weather in January, the highest shade recording being 103.5 degrees F.

1959 Planting Conditions for the 1960 Crop

The wet season was late in commencing and the heaviest rain fell in March when 39.20 inches was recorded. Precipitation for the six months ending June 1959 was 77.52 inches which is over 15 inches above average for that period. The showery weather continued up to the end of June and, while falls were not heavy, they were sufficient to keep low lands too wet for land preparation. The result is that the acreage planted in the autumn must be a record low. This applied particularly to the wetter areas of Gordonvale and Babinda.

Due to wet soil conditions germinations, generally, have been slow. There was little damage by flooding, and the absence of any strong winds left cane in good condition for the 1959 harvest.

Pests and Diseases

The position regarding ratoon stunting disease is good. Yellow spot infestation developed late in the susceptible varieties due to the wet and cloudy autumn, and leaf scald is more in evidence than normal. Bacterial mottle has now been located in the Babinda area but in most cases

RAINFALL RECORDS, 1924-1959.

Year	Rainfall in inches	Year	Rainfall in inches
1924–25 ..	82.86	1942–43 ..	64.60
1925–26 ..	49.02	1943–44 ..	52.92
1926–27 ..	80.34	1944–45 ..	120.34
1927–28 ..	72.46	1945–46 ..	63.95
1928–29 ..	92.83	1946–47 ..	35.24
1929–30 ..	69.99	1947–48 ..	69.12
1930–31 ..	75.62	1948–49 ..	85.77
1931–32 ..	61.87	1949–50 ..	83.50
1932–33 ..	90.02	1950–51 ..	67.68
1933–34 ..	119.09	1951–52 ..	52.86
1934–35 ..	58.22	1952–53 ..	83.98
1935–36 ..	87.64	1953–54 ..	68.15
1936–37 ..	49.54	1954–55 ..	99.81
1937–38 ..	53.28	1955–56 ..	71.91
1938–39 ..	126.79	1956–57 ..	76.27
1939–40 ..	82.10	1957–58 ..	75.01
1940–41 ..	80.59	1958–59 ..	82.83
1941–42 ..	41.55		

Average Rainfall for 35 years: 75.08 inches.

is not very important. Droopy top continues to be noted on sandy soils.

Rat damage was at a minimum during the 1958 harvest, and present indications are that it will again be small this year.

Grub damage in northern areas was slight, and mostly where BHC had not been applied. Pigs are causing less damage in the Cairns area, but are more numerous in Mossman. The striped phalanger started to attack cane in April, which is earlier than usual. Some slight wireworm damage was reported at West Cairns.

EXPERIMENT STATION OPERATIONS

Seedling Raising and Selection

In conformity with usual practice fuzz was planted in the glasshouse during July, and subsequently 44,000 seedlings were planted in the field in October. These consisted of 8,000 spaced seedlings and some 36,000 in bunches.

Selections during June-July 1958 resulted in 1,351 seedlings being selected for planting in 30, 10 and 4-sett plots, while 23 varieties from the 30-sett plots were planted in a lattice square variety trial.

New Varieties Imported

Fifty-nine new varieties were introduced to this station during the year for use in cross-pollination work and for trial as commercial canes. Also introduced were 217 varieties from the New Guinea collection which had been in quarantine for 12 months at Magnetic Island.

Legumes

Plots, each of ten plants, were set out using 500 different strains of cowpeas from ten families, which had been bred on the Station. There were some very promising individual strains and these will be further tested.

Abstract of Meteorological Observations made at Northern Sugar Experiment Station, Gordonvale, from 1st July, 1958 to 30th June, 1959.

Month	Rainfall in Inches	Average Rainfall	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Temperature 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.	Average Daily Hours Sunshine
				Maximum			Minimum						
				High	Low	Mean	High	Low	Mean				
1958—													
July	.05	1.02	1	90	74	82.39	68	38	56.77	25.62	69.17	80.66	6.67
August	.59	.93	6	89	80	84.68	71	50	59.39	25.29	72.45	73.48	8.23
September	.40	1.13	4	93	79	86.40	68	49.5	59.32	27.08	75.53	65.8	7.71
October	.17	1.51	3	100	86	91.23	71	55.5	63.98	27.25	80.00	59.10	9.44
November	3.01	3.02	13	99	80	90.55	71	54.5	67.65	22.91	80.37	69.17	8.48
December	1.09	4.99	7	97	88	93.80	77	65	71.74	22.06	83.70	67.41	7.99
1959—													
January	14.10	15.81	25	103.5	80	92.52	79	63	74.27	18.25	82.97	77.10	5.20
February	14.46	19.19	15	99	77	90.16	78	68	71.36	18.80	80.68	78.46	7.00
March	39.20	15.96	28	93.5	80	85.98	78	68	71.82	14.16	77.23	88.81	3.85
Apr	4.65	6.11	21	89	80	83.77	73.5	64	67.73	16.04	76.27	88.30	5.95
May	3.39	2.65	27	83	68	79.37	70	58	65.37	14.00	72.48	85.77	2.89
June	1.72	2.12	14	82	70	77.43	69	49	61.53	15.90	69.47	83.30	4.40

Hot Water Treatment

Further experiments were carried out to obtain information regarding germination of heat treated plants. These trials commenced in June and carried on until September. The most important information gained was that there is an increase in the resistance to hot water damage as the season progresses and, that in planting late in the season, best results were obtained by using top plants of non-arrowed sticks.

Experiments Harvested During the Year

The first ratoon yield observation trial was harvested. In the final grading, taking into consideration both plant and ratoon crops, one variety beat the standard. This was 54N.7103. Others very close were 54N.7096, 54N.6441, Q.62 and Q.67. These varieties are being propagated on farms.

In the plant yield observation trial no variety gave better grading than the standard, but the following are worthy of further trial: 55N.720, 55N.817, 55N.810, Q.58 and Q.70.

The plant variety trial on Division A3 was harvested. The results for the plant crop were:

	Tons per acre	*Sugar per acre*
Pindar	42.71	4.66
H.40-1184	38.28	4.22
M.614	30.32	3.82
M.701	34.00	3.75
C.P.43-47	28.95	3.70

No variety was superior to the standard, but the trial will be harvested again in the first ratoon crop.

Cane Deterioration

In view of the developments in mechanical cane harvesting, three trials were conducted to compare the rate of deterioration of cut up cane and whole sticks over a period of four days. Results showed very little difference. Full details are given elsewhere in this report.

Filling flats with a special mixture of soil, sand and rotted filter cake. After sterilization the flats are used for growing the tiny cane seed.

Some of the 500 visitors at Annual Field Day inspecting the tractor and implement display.

Some of the visitors from South Africa inspecting the experimental work on Meringa Station.

A Meringa seedling cane, 54N7103, in one of the progressive selection trials.

Field Day

Field Day was held on May 21st when approximately 600 persons visited the station. This is a 50 per cent. increase on the previous year, due to the fact that weather conditions had been such that planting operations had been held up, leaving growers free to attend. The showing of 35 mm. colour slides on various aspects of the sugar industry was much appreciated by the visitors.

Breeding Cane Collection

The variety garden was maintained and there are now 409 varieties on the station exclusive of original seedlings and seedlings under test. Many varieties, not actually used in breeding work, were transferred to the Elliott variety garden at Bundaberg.

Miscellaneous

Approximately 13 acres of forest land adjoining our boundary was purchased during the year, and this has been cleared and grubbed. Six acres have been brought under the plough, together with the three acres of original scrub land which was cleared last year. This area will be available for experimental work during the coming spring.

Laboratory Work

The following is a summary of cane samples handled during the year :

Station and trial samples	2,154
Farmers' samples	46
	2,200

Summary of Crops Grown on the Station

	Tons
Parent canes and trials	582.74
Original seedlings	71.06
	653.80
Plant cane harvested for the mill ..	366.26
Ratoon cane harvested for the mill	287.54
Used for plants, samples, cross-pollination, farm trials, etc. ..	35.00
	688.80

Area of plant cane harvested ..	13.00 acres
Area of ratoon cane harvested ..	9.40 acres
Average tons per acre ..	30.75 tons
Average c.c.s.	13.51

Part of Meringa Station becomes waterlogged in the wet season. This main drain leads excess water to an adjacent creek.

Portion of the Experiment Station has a scattered infestation of nut grass. Methyl bromide fumigation under visqueen sheets is being successfully used for eradication. This costly method is worthwhile on small areas.

Lower Burdekin Sugar Experiment Station

G. A. Christie, Officer in Charge

Weather Conditions

The rainfall of 33.29 inches recorded on 65 wet days in the year 1958-59 was somewhat less than the district's average precipitation, and it was characterized by the absence of the typical, heavy, monsoonal rains usually experienced in the first three months of the year. Instead, scattered storms in this period provided most of the rain, in addition to one day's recording of 596 points in February associated with an intense tropical cyclone. Following the normal pattern for this area, the months between July and November 1958 inclusive, yielded very little rain, while storms in the latter half of December, 1958, provided 4.29 inches. No very high registrations were noted in the records for January, 1959, which gave 13.13 inches on 14 wet days.

On 16th February, 1959, an intense tropical cyclone approached the coast from a north-easterly direction and its centre remained stationary a few miles east of the Burdekin delta for several hours before developing its south-easterly direction following the coastline. The lowest barometric pressure recorded at Ayr on that day was 28.80 inches and, for several hours, wind gusts, estimated at over 100 m.p.h., caused severe damage to crops and property in the district. No rain had preceded the cyclone and the 5.96 inches recorded on that day provided most of the month's precipitation. Light showers throughout most of March and early April yielded only a small amount of rain, followed by 1.94 inches in the latter half of May. Very little rain was recorded on two wet days in June.

Spring, summer and autumn temperatures were similar to those normally experienced in the district, but a cold period near the end of June, 1959, produced frosts on several mornings, the minimum screen temperature recorded at this time being 39 degrees.

Crop Notes

With the restrictions applying to the production of sugar by Queensland mills, the crushing season in 1958 was somewhat shorter than usual, and the comparatively dry spring and early summer months provided excellent conditions for the removal of the crop. An estimated 200,000 tons of cane remained unharvested, and most of this was stood over for the 1959 crushing. Following extensive lodging and breakage of stalks in the February cyclone, and the subsequent deterioration in quality of standover crops, many fields were destroyed and varying results were obtained from the remainder when the 1959 crushing commenced.

Anticipating restricted production applying in 1959, considerably less fertilizer was used on plant and ratoon crops in 1958, but this did not appear to retard their progress unduly. The effect of high winds on these crops varied considerably according to variety, state of growth and soil conditions. Advanced crops lodged, but were otherwise little damaged. The less advanced suffered breakage of the stalk at the top or base, those decapitated being varieties susceptible to wind damage or others which had produced succulent growth just prior to the strong wind. Dry or sandy soils appeared to hold the stools more rigidly and, under these conditions, breakage at the base of the stalk was common.

Recovery from the cyclone was quite rapid, but it is obvious that several weeks of good growing weather was lost and this should be evident as the 1959 harvest proceeds.

Pathological Notes

Once again conditions were unfavourable for the development of symptoms of chlorotic streak disease in the Giru area and consequently no survey to ascertain the extent of infection was practicable. It is believed, however, that the continued use of hot water treated planting material,

The early 1959 cyclone in the Lower Burdekin district caused serious crop damage. The wind-resistant Q.57 maintained its good reputation and did not lodge.

In contrast to the Q.57 depicted above Pindar crops were decapitated over extensive areas by the severity of the wind.

particularly on farms where the disease had been located, must assist in checking its further spread. To date, no chlorotic streak has been detected in the Burdekin delta area and all precautions to prevent the unauthorized introduction of suspect planting material are being taken.

Internal stalk symptoms of ratoon stunting disease can occasionally be detected in the area, principally in fields which have had a severe check in growth. A vigorous campaign to provide hot water treated planting material has been continued by the local Cane Pest and Disease Control Boards and it is staunchly supported by most cane growers, who realize the advantages of using disease free planting material.

A number of fields, mainly in the variety Q.57, showed bacterial mottle in the Giru district, particularly where flood waters had passed through the farms in 1958. In most cases the outbreaks were small, and the economic losses from this disease would, at the present time, be negligible. However, a careful check is being kept on diseased fields and adjacent grassland to reduce the possibility of heavier infestation in future years. A few diseased stools were also located on farms in the Lower Burdekin area.

Regular and thorough inspections by officers of the district's Cane Pest and Disease Control Boards, the careful selection of plants and the decreasing areas planted to susceptible varieties, have apparently eliminated mosaic disease from this area, since no infected stools have been located during the past three years. Although it has never been responsible for major losses in this area, the eradication of any cane disease is an achievement for which those associated with such work can be commended.

Top rot, which caused moderate losses when the variety Badila was extensively grown in this area, gradually became of less importance as that variety was replaced by more resistant ones. With the recent extensive plantings of Q.67, it may again be of economic importance, since this variety has proved susceptible to the disease in land of high fertility, where Q.67 may become an important variety in the future. Factors associated with top rot in this variety are to be investigated in the near future.

Reference has been made in earlier reports to the occurrence of an unidentified disease affecting the variety Q.57 and, to a lesser extent, Pindar. Little progress has been made in investigations into this disease, but the reducing popularity of the susceptible varieties, and more careful selection of planting material, may result in its elimination.

Another complaint which is of minor importance has been submitted for pathological study, field symptoms being apparent in sup-

pressed root development associated with poor growth of the stool.

The sett rotting pineapple disease which, some years ago, was responsible for poor germinations in the Burdekin and Giru areas, has now virtually ceased to be of any importance, since the pre-planting treatment of setts in a mercurial solution has now become a routine practice on practically every farm in these areas.

Entomological Notes

A small amount of greyback grub damage is evident in the crop for 1959 harvest, infestation occurring in localities where no BHC was used, or where the application was not done effectively. The use of worn distributors for BHC dust leads to uneven application of the insecticide, and complete protection from greyback grub damage cannot be expected.

Over 100 acres of plant cane were treated by spraying in the half-open drill a water suspension of lindane, the refined gamma isomer of BHC, and no grub damage was observed in the 1959 crop. It was not possible to establish control areas in these localities to ascertain whether grub populations were sufficient to cause crop losses, but areas where the spray was used have, in past years, suffered severely from this pest, and the protection over several years indicates that satisfactory results from this method can be expected. The lesser cost of material, in addition to the fact that it can be placed in the most suitable area of the root zone, may result in a considerable expansion of this method of application in the near future.

Other Pests

Dry conditions during the spring and early summer brought packs of wallabies from the neighbouring grazing land to feed on the young cane shoots. Quite heavy damage was caused on some farms, but damage lessened after the rain in December, which produced a succulent growth of young grass.

Standover Trojan crops were flattened by the cyclone.

Coots also invaded cane land adjacent to lagoons, and shooting was the only means of effectively deterring these pests. A carbide gun set to detonate at seven to eight minute intervals was found to be quite ineffective with both wallabies and coots after the first few days of operation.

Wild pigs caused minor losses, and damage by rats may have been a little greater than normal, standover crops providing some protection for the rodents.

Slight damage to crops is also recorded from damage by termites but the overall loss of cane is of very minor importance.

Weeds

Several areas where Johnson grass was established were located and, although this grass is not listed as a noxious weed, its destruction is of importance and steps are being taken to control it. The control of weed and grass growth in irrigation feeder channels also received attention and trials were set out using varying combinations of commonly used weedicides.

Following experiments in the first half of 1958, work proceeded with the eradication of nut grass on two of the Experiment Station fields. Fumigation with $1\frac{1}{2}$ lb. of methyl bromide per 100 square feet continued to be effective and, during the year, patches totalling 38,337 square feet were treated. The results are so satisfactory that an increased area will be fumigated in 1959-60.

EXPERIMENT STATION ACTIVITIES

Seedlings

An increased number of original seedlings was available for selection in June, 1959, from 6,119

The Annual Field Day attracted 250 local growers.

single plants and 3,270 double setts planted from the previous year's bunch planting. The superiority of the latter at selection was evident and an expansion of bunch planting and subsequent sett propagation will be undertaken in the future. In addition to the more suitable types produced, the July sett planting provides growth conditions for the crop, comparable to those applying for the district's normal planting.

Selection of the original seedlings in June, 1959, yielded 114 varieties receiving a higher grading and these were planted in 40-sett plots together with a suitable number of plots of standard varieties. Others totalling 306 which received a slightly lower grading were planted in 4-sett plots. This latter planting has been used on this Station for the first time and it follows successful experimental work carried out at the Northern Experiment Station.

1955A-Series

In 1958, a heavy crop in the replicated yield observation trial was harvested and one seedling outyielded both Trojan and Pindar standards in tons of cane and sugar per acre, average crops

Q.58 is performing well on non-irrigated lands in the Giru area. Its sucrose content is particularly high.

Abstract of Meteorological Observations made at the Lower Burdekin Sugar Experiment Station for the Year 1st July, 1958, to 30th June, 1959.

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Temperature 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1958											
July	..	..	85	65	78.52	65	43	51.74	26.78	66.81	73.85
August	.01	1	87	78	81.48	65	46	55.70	25.78	72.30	68.44
September	.54	3	89	74	81.63	69	45	56.96	24.67	74.08	67.91
October	..	..	95	80	85.92	71	54	61.50	24.42	81.19	65.65
November	.93	6	93	80	86.09	70	59	65.65	20.44	81.78	62.13
December	4.29	7	91	84	87.92	77	63	69.56	18.36	83.64	64.80
1959											
January	13.13	14	93	84	88.80	79	67	72.71	16.09	83.67	77.48
February	6.99	6	94	79	86.28	74	66	69.72	16.56	82.00	73.22
March	3.48	15	89	76	83.82	76	64	66.66	17.16	79.85	79 63
April	1.79	3	87	76	83.73	74	57	63.82	19.91	77.00	76.96
May	1.94	8	87	67	79.50	69	56	60.64	18.86	72.35	78.54
June	.19	2	80	72	77.57	63	39	53.71	13.86	67.76	73.29
Totals	33.29	65									

Disastrous floods have been caused by breaks-through on the Burdekin River Banks. Here a flood mitigation measure raises a levee alongside a vulnerable farm.

for the three leading seedlings and standards being:—

Variety	*Tons cane per acre*	*Tons sugar per acre*
55A408	60.62	10·00
Pindar	58.37	9.50
Trojan	59.80	9.27
55A410	58.96	9.13
55A431	56.78	8.82

Plots of these and other seedlings from the same trial have been established on a number of farms in the district to assess their value as commercial canes; this planting on farms in the district may, in future, replace the randomised block trial which, in past years, has been established on the Station.

Canes for Poorer Lands

Of the many "poor land" varieties being tried on less fertile or unirrigated areas, Q.58 and Q.63 appear to be showing promising results. Q.63, with its particularly high early sugar content, may find a place on the medium class lands. N.Co.310 showed high resistance to cyclone damage following excellent early vigour, but its late growth is disappointing.

Isolation Plot

The Burdekin isolation plot located some 30 miles from the nearest commercially produced cane, continues to provide excellent quarantine facilities for varieties being introduced to this comparatively disease free area from other districts. The importance of this plot cannot be overemphasized in providing facilities for detecting symptoms of any disease which could result in heavy losses in this area. Regular inspections are maintained throughout the growing period of canes in the isolation plot.

Irrigation Trial

This trial, which was harvested on the Experiment Station in 1958, showed considerable variability in plots, and the results were of rather limited practical value. Many difficulties in conducting such a trial were encountered, and this information can be put to good use if a similar trial is attempted in the future.

Ratooning

Two long range ratooning experiments are being carried out on the Experiment Station to ascertain whether agronomic factors influence the growing of ratoons in this area. Plant cane of three varieties in a quantitative trial was harvested in 1958, (some plots being ploughed out after harvest, and prepared for planting in 1959 following a predetermined plan), while others were ratooned. From the plots which were ratooned, and those planted in 1958, a comparison of plant

and first ratoon crops, under similar seasonal conditions, will be available during the 1959 harvest, while the following year comparisons between plant, first and second ratoons should provide useful information. Unfortunately, one of the varieties in the trial, Pindar, suffered severe breakage of tops in the February cyclone.

Plant cane harvested in 1957 and first ratoons in 1958 showed a dropping off in yield in a qualitative ratooning trial in the three varieties, Trojan, Pindar and Q.57, the following tonnage yields being recorded:—

Variety	*Tons cane per acre Plant crop*	*Tons cane per acre First ratoons*
Trojan	60.43	50.56
Pindar	62.32	46.84
Q.57	54.31	38.40

The second ratoon crop was well developed and showed little damage from strong winds.

Legumes

The practice of legume cover cropping, during the period when fields are not under cane, is not extensively used in this area, and experiments have been set out to ascertain the actual value of such crops in their addition of nitrogenous plant food to the soil. Velvet bean was generally planted, but local growers are endeavouring to produce seed of two cowpeas, Malabar and Black Eye No. 5, which may prove more suitable than velvet bean for short fallow periods.

A further step in fixing strains of cross pollinated legumes resulted from collecting seed from F5 generation of crosses developed at the Northern Sugar Experiment Station.

Field Day

A successful Field Day was held at this Station on 19th May, 1959. Although the attendance was not large, visitors showed considerable interest in the Station's activities and in the addresses delivered by senior Bureau Officers and others associated with the sugar industry.

Laboratory Work

The following is a summary of the c.c.s. analyses carried out during the year:—

Experiment Station samples	1,196
Farm trials	437
Standover cane investigations ..	244
Growers' samples	48
	1,925

Summary of Crops Grown on the Station

	Tons
Trojan	535.25
Pindar	77.67
Q.57	63.38
Experimental varieties	481.57
Total	1,157.87
Plant cane harvested	928.69
First ratoon cane harvested	229.18
Total	1,157.87
Total cane harvested for mill	1,157.87
Used for samples, plants, etc.	24.00
Total Crop	1,181.87
Total acreage harvested	27.91 acres
Average tonnage per acre	42.34 tons

The two outstanding lodging-resistant canes, Q.67 (left) and Q.66 (right) growing on a Lower Burdekin farm.

Q.63 is a fairly recent production and its favourable yields and very high sugar content augur well for its future.

Central Sugar Experiment Station

C. G. Story, Officer in Charge

Weather and Crop Notes

A cold snap was experienced during the first week in July, 1958, with frosts recorded on four consecutive mornings in susceptible areas. The rainfall registration for July was the lowest for 15 years at the Experiment Station, with the first eight days of August the warmest experienced for this period since 1952.

There were showery conditions during the first four days of September, followed by typical spring weather with summer conditions towards the end of the month. No rainfall was recorded for October, it being the driest October since 1918.

Mackay had its heaviest rainfall for five and a half months in mid-November. This was general throughout the district, although falls varied from one and a half to four and a half inches. Good general storms were experienced throughout the district from the 16th December, with the main falls on the 18th and the 28th.

The 1958 crushing season terminated on the 16th December when Cattle Creek mill ceased operation. Seasonal conditions and improved cane varieties combined to produce the largest crop in the district's history; unfortunately, this was offset by harvesting restrictions. Ideal harvesting conditions prevailed for the period of the season.

The rainfall for the calendar year 1958 at the Sugar Experiment Station was 136 inches recorded on 132 days, the highest since the Station commenced operation at Te Kowai in 1935. From the 1st July to the 31st December, 1958, 13.49 inches were recorded on 38 days, the majority of this in December on eight days.

Rainfall for the first four months of 1959 was well distributed, but the typical, torrential wet season did not eventuate. Although Mackay missed the full force of a cyclone which crossed the coast on the 16th February, Proserpine district suffered damage. Showery conditions prevailed throughout May and a cold snap was

experienced during the middle and at the end of June, 1959. A total of 48.11 inches of rain was registered on 107 days during the first six months of 1959—a contrast to the corresponding period in 1958 when 122.51 inches were registered on 94 days.

Favourable weather was experienced throughout planting operations in July and August, 1958, and the district planting was completed at the end of September on those wet areas which are normally planted late in September or early October. Good germinations resulted from July-August planting, except where red rot was present, or where wireworms had damaged cane due to omission or incorrect application of BHC.

Standing crops were unaffected by the dry weather in October, nor was young cane distressed, although rain would have been appreciated throughout the district. The mid-November and December rains ensured good crop progress in those months. Conditions were ideal from January to mid-April, but standover crops lodged with wind at the end of January, and the cyclonic winds in February. In contrast to other cyclonic disturbances, the soil was not waterlogged; the root damage gave the cane a minor setback but this was offset by subsequent excellent growth conditions.

The 1959 early planting programme was behind schedule due to climatic conditions, although a reasonable amount had been completed in the drier sections of the district by the end of May; the young early plant cane made good progress under the showery conditions experienced. Arrowing of cane crops was pronounced, and this increased throughout the district in June, 1959. Following fine weather, cane growers commenced farm operations in mid-June with land preparation and planting during the last half of the month. Except on very low, wet country, land dried out fairly rapidly to enable farm operations to proceed. Many cane growers were preparing to

The old standard cane M.1900 (right) and one of the new ones, Q.58 (left) illustrate the reason for the district's present stability. Both are second ratoons of the same age.

plant if possible before the start of the crushing season. The estimated crop for the eight mill areas is in excess of peaks, despite reduced fertilizer applications on many ratoon crops.

ANNUAL RAINFALL SINCE 1935 AT THE EXPERIMENT STATION, MACKAY

Year	*Rainfall (Inches)*	Year	*Rainfall (Inches)*
1935–36 ..	99.57	1947–48 ..	38.40
1936–37 ..	64.21	1948–49 ..	46.95
1937–38 ..	47.21	1949–50 ..	85.48
1938–39 ..	61.29	1950–51 ..	107.63
1939–40 ..	82.86	1951–52 ..	41.68
1940–41 ..	73.71	1952–53 ..	56.58
1941–42 ..	57.75	1953–54 ..	102.57
1942–43 ..	76.13	1954–55 ..	129.44
1943–44 ..	58.67	1955–56 ..	82.27
1944–45 ..	33.53	1956–57 ..	55.87
1945–46 ..	68.52	1957–58 ..	133.09
1946–47 ..	48.09	1958–59 ..	61.60

Average for 24 years—71.38

Pests

Damage to the 1958 crop from both greyback and frenchi grubs was assessed at the low figure of 350 tons in untreated cane. There was a considerable reduction in the area treated with BHC during 1958 and flights of both greyback and frenchi beetles occurred from late November 1958 to early January, 1959. Wireworms were responsible for damage to germinations in a number of fields where cane growers neglected to apply the protective BHC-fertilizer mixture at planting; some cane growers still apply inadequate amounts of this material. Trials have shown that BHC is not responsible for germination problems, and that damage by root stubbing is over-stated. The replacement of crude BHC by the highly refined lindane may alleviate this situation.

The availability of natural feed prevented heavy wallaby damage although £1,053 was paid as bounty on scalps. Rat damage during 1958 was very light in contrast with the heavy infestation which occurred in 1957. Eradication measures were instituted against giant sensitive plant located at Sunnyside by the Mackay Cane Pest and Disease Control Board. Previous occurrences of this plant pest were checked by the various Cane Pest and Disease Control Boards.

Coots were again troublesome, but satisfactory results were reported from the use of split stalks of cane impregnated with the poison strychnine. Cockatoo damage was reported from the Proserpine district, Sunnyside, Pinnacle and Mia Mia. Trials revealed that an Exid carbide gun would

Abstract of Meteorological Observations made at the Central Sugar Experiment Station during period 1st July, 1958 to 30th June, 1959.

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperatures						Mean Diurnal Range	Mean Temperature 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1958											
July	.09	1	84.5	69	75.98	62	41	49.14	26.84	64.42	78 52
August	1.53	13	84	66	76.85	66	42.5	54.87	21.98	69.76	70.72
September	1.56	7	88.5	69	78.85	70.5	41	54.79	24.06	72.60	58.17
October	..	..	97.5	79	86.08	68	51	58.47	27.61	80.42	50.40
November	2.24	9	91.5	80	85.34	69.5	62.5	66.09	19.25	81.42	58.15
December	8.07	8	96.5	82.5	88.57	76	62	68.79	19.78	83.67	63.53
1959											
January	11.48	22	92.2	80.5	85.69	77.5	66	72.10	13.59	81.22	77.72
February	12.27	18	91	78	84.27	76	64.5	70.07	14.20	79.57	76.96
March	11.78	16	91	77	83.79	72.5	64	69.48	14.31	78.89	78.95
April	6.58	22	84	75.5	80.03	73.5	59.5	64.43	15.60	74.88	81.55
May	4.95	20	79	66	75.00	72.5	53	61.32	13.68	69.81	79.56
June	1.05	9	75	68	72.73	62.5	40	53.48	19.25	65.60	78.60
Totals	61.60	145									

frighten birds away from cane blocks; the two main varieties, Q.50 and Q.58, are relished by these bird pests. Minor incidences of Striga occurred.

Diseases

Chlorotic streak disease was located on additional farms. The results of a trial with diseased and healthy plants showed that heavy losses are experienced with the major varieties in the area. A further trial has already shown the value of clean planting material compared with diseased planting material in germination and early growth.

A suspected new strain of mosaic disease was located in the variety Q.50 at Farleigh, and all cane in the adjacent area was inspected and rogued. In the overall campaign to eradicate mosaic disease from the Habana district considerable progress was made, and the affected growers are co-operating satisfactorily with the local Cane Pest and Disease Control Board.

The three Cane Pest and Disease Control Boards in the central district hot water treated nucleus quantities of cane for individual cane growers during the 1958 season at the recommended 50°C. for 3 hours. The number of cane growers using this service has increased as more appreciate its value. The regular treatment and infusion of clean seed cane to individual farms is important in the programme against ratoon stunting disease, especially since contamination has occurred in cane derived from the original 2-hour treatments.

Bacterial mottle is prevalent on country subject to flooding, and the disease has been found in grasses peculiar to these areas. The variety Q.57 is very susceptible but, fortunately, the new variety Q.73 has a high standard of field resistance in similar localities.

An area of Q.58 at Gargett and one of Trojan at Finch Hatton were affected by the fire blight stage of eye spot. Germination problems due to pineapple disease were experienced with plants not protected by organic mercurials; this protection will be necessary in 1959 on blocks where cane is planted following destruction of standover cane.

Legumes

Excellent crops of velvet bean and cowpea were a feature of the period under review, since climatic conditions were ideal for these crops. The 1958 legume sowing, based on seed supply available, was approximately 7,900 acres, but seed supplies of new types were very restricted. Growers may plant more seed this year with restricted cane plantings. The perennial legume *Centrosema pubescens* has possibilities on the larger properties which intend rotating blocks to long term legume fallow.

Q.73 is a new Mackay variety suited to the richer soils.

Fertilizer Advisory Service

The demand for this service was less than in the previous year, and there are many examples throughout the district of unthrifty growth where cane growers neglected to fertilize blocks of ratoon cane due to the prospects of a restricted harvest for 1959. Fortunately plant blocks received the necessary attention.

Varieties

Worthy of comment in the 1958 season was the excellent sugar content of the variety Q.63 in all mill areas. The highest individual c.c.s. figures obtained for many years were recorded with this variety in its first year on the approved lists. It was favoured in early 1959 plantings.

The need to destroy surplus cane resulted in many methods being devised. Here a direct-attached and power-driven stubble shaver chops up the crop for subsequent ploughing.

Unfortunately the leading variety, Q.50, is developing a tendency to semi-erectness and lodging in its habit, and did not tolerate wind to the same extent as previously.

The five varieties Q.50, Q.58, Pindar, N.Co.310 and Q.63 constituted the bulk of the 1958 tonnage harvested. There is a need to review the approved variety lists and delete a number of the older varieties which are not grown extensively, so that new varieties being added will not make these lists unwieldy.

Destruction of Standover Cane

Large acreages of cane were destroyed by divers methods at the end of 1958. Rotary slashers, rotary hoes and offsett discs were among the implements used to handle this operation.

EXPERIMENT STATION OPERATIONS

Seedling Raising

A total of 8,336 single and 2,430 bunch planted seedlings, representing 77 crosses, were planted in the field during late July–early August, 1958. These were from cane seed planted in the glasshouse in March, 1958. The standard of this batch of seedlings with modern varieties featuring in the parentage was very suitable for the higher rate of selection required in 1959.

Annual Seedling Selection

Selection of seedlings planted in the field in July-August, 1957 resulted in 451 seedlings, representing 56 families, being planted in 20-sett plots for comparison with the standard Q.50. In addition, five seedlings, representing two families, were selected from the 1956 bunch plant double sett plantings.

Progressive Seedling Trials

The first ratoon crop of the yield observation trial of 29 of the 53-series seedlings and Q.55 was harvested in October, 1958. Fifteen of these seedlings were selected for observation plantings on three properties in the district.

The replicated yield observation trial with 38 of the 54-series seedlings and the varieties H.25, Q.61, Q.70 and Vesta, planted in 1957, was harvested late in September, 1958. This trial yielded well, despite adverse climatic conditions at planting. Final selection of any canes which justify further trial will be made on the first ratoon crop in 1959; already seven preliminary selections for better land have been planted out.

A total of 30 of the 55-series seedlings was selected from the first ratoon 30-sett plots. These seedlings plus B.45/151, C.P.38/34, C.P.50/11, C.P.51/27 and 40S.N.746 were planted in a replicated yield observation trial with Q.50 as the standard. Thirteen additional seedlings were selected for further trial as possible better land canes.

A general distribution of Q.57 and Q.68 occurred during 1958 and these varieties were added to the approved lists for the eight central district mills in 1959.

Long Term Phosphate Trial

Two cycles of this trial have been completed. There were no significant differences in the five crops of cane harvested since this trial was inaugurated on 1st ratoon Q.50 in 1952. The objectives of the trial are to determine (1) the rate at which this soil becomes depleted in phosphate ; (2) whether the amounts used will result in a build-up of soil phosphate and (3) to what extent rock phosphate can be used to replace superphosphate.

Long Term Trash Trial

Seven crops of this trial have been harvested, being three crops each for the first and second cycles and the plant crop of the third cycle. There are no significant differences in tonnage due to trash conservation on this particular trial site.

Experiment with Bagasse and Deep Ripping

This experiment was initiated in 1953 with the application of bagasse and deep ripping of plots

A heavy growth of crotalaria usaramoensis is disced down during land preparation.

in the trial site. Four crops have now been harvested and the following results show the advantage gained from the bagasse treatment :— (a) Bagasse applied before planting and the land ripped to allow the material to penetrate the subsoil (Total of four crops—97.8 tons of cane) ; (b) Land ripped only (Total of four crops—91.7 tons of cane) ; (c) Control plots—no bagasse and no ripping (Total of four crops—85.5 tons of cane).

The effect of the treatment is still marked in the fourth crop—which is the plant crop of the second rotation. In that crop the plots receiving bagasse, and subsequently ripped in 1953, yielded 4.1 tons of cane per acre more than the controls.

Short and Long Fallowing Trial

This experiment, first planted in 1948, was based on the following treatments : (a) a six-months legume fallow, followed by normal cane cycles of plant, first and second ratoon crops, (b) a four years grass fallow, (c) one 12 months plant crop, followed by two years grass plus six months legume fallow, and (d) one 12 months plant crop, followed by two and a half years perennial legume fallow. The fallow periods were arranged so that all plots were ready for planting with cane at the same time—August, 1952. This 1952 planting was the second phase of the trial, entailing two further crop cycles of cane.

The trial was completed in 1958 with the harvest of the first ratoon crop of N.Co.310. The total tonnages of cane harvested from each treatment were :

	Treatments			
	(*a*)	(*b*)	(*c*)	(*d*)
Total tons cane per acre	184.81	156.12	162.17	168.87
No. of crops harvested ..	8	5	6	6
Average tons cane per acre	23.1	31.22	27.03	28.14

Part of the legume breeding project. On the Mackay Station the various families are grown in separate plots. At the end of June, 1959, many of these cowpea types still maintained excellent cover.

Planted: 1948—Treatments (a), (c), (d) to Q.50.
1952—All treatments to Q.50.
1956—All treatments to N.Co.310.

Unfortunately these treatments were not replicated but the results are interesting to those cane growers who intend long fallowing cane land while the present restrictions on production exist.

Deterioration Trials

Three trials—early, mid and late harvesting season—were carried out with the object of estimating the degree of loss of sugar in cut-up cane stalks as produced by a type of mechanical harvester compared with normal whole stalk harvesting. Cane varieties included in the Mackay trial were : Q.50, Q.58 and Q.63. There were no significant differences between the two methods.

Legumes

Cowpea seed containing the progeny of twelve crosses was planted out in separate plots for purification purposes.

Families containing Malabar, Black Eye No. 5 and C.P.I.12153 as parents performed well, producing excellent cover crops which continued growth late in the season. These cowpeas were still actively growing at the end of June, 1959. The velvet bean crop had finished the previous month. Over 200 lb. of fifth generation seed was collected from these plots early in 1959 for further planting later in 1959. Black Eye No. 5, grown for seed production, yielded well.

Weedicides

An economical application of the weedicide 2,4,5-T was found to be effective on the winter weed known as blue top and also on *Crotalaria* species. Herbicides TCA and Dowpon were found to be equally effective in controlling grasses at rates which cost £5 and £10 per acre for both materials. The species were common couch, crowsfoot, and carpet grass.

Field Day

Climatic conditions were excellent for the Annual Field Day on the 16th June, 1959 which was attended by 500 visitors. Among the many features on the Station, a display of advanced seedlings, approved and new varieties, specimens of diseased cane, Striga and a theatrette featuring cane subjects, created considerable interest. The large tractor and implement display was excellent.

Laboratory Work

The following is a summary of the c.c.s. analyses carried out during the year:—

Experiment Station	1,234
Farm Trials	394
Growers' Samples	110
Show Canes	34
Standover Samples	123
	1,895

Summary of Crops Grown on Station

	Tons
N.Co.310	122.2
Q.50	124.56
Q.58	153.55
Q.63	40.66
Seedlings	416.34
Total	857.31
Plant Cane harvested	358.74
First Ratoon Cane harvested ..	420.21
Second Ratoon Cane harvested ..	78.36
	857.31
Total Cane harvested for Mill ..	857.31
Used for samples, plants	24.05
	881.36
Total acreage harvested ..	34.94 acres
Average tonnage per acre ..	25.23 tons

The turnsole weed (Heliotropium amplexicaule) presents control problems in the Isis district. Here it is seen on a tramline easement.

Southern Sugar Experiment Station

H. G. Knust, Officer in Charge

Weather Notes

Dry conditions set in soon after the beginning of July, 1958 and prospects for a good season were not promising as the year progressed. However, good rain fell about mid-December and well-spaced, adequate rains were recorded for the remainder of the year. The total rainfall, 45.24 inches, was slightly better than average. The light frosts which occurred in July, 1958 and June, 1959 caused only superficial damage to foliage in frost prone situations.

Crop Notes for 1959 Season

Ratooning followed the usual pattern, slow but uniform in coming away generally, with a few failures on farms with a poor ratooniny history. Dry conditions in the spring and early summer months retarded growth in all crops and created poor conditions for a reliable germination in spring plant. However, warm and moist conditions prevailed throughout the summer months and, as a consequence, crops made rapid uniform growth. Preliminary estimates for the 1959 harvest in the Bundaberg-Isis area amount to 1,817,000 tons from 67,800 acres. Present indications are that a surplus of some 280,000 tons will remain in the field after harvest ceases. Flagging began to show in N.Co.310 on the coastal section at the end of April, and the variety was profusely arrowed by the end of May, while C.P.29/116 was moderately flagged and slightly arrowed at that time. Other varieties were showing light flagging at the end of June. It is of interest that the two aforementioned varieties produced the bulk of the crop in 1958.

Prospects for 1959 Season

Shortage of planting material because of dry conditions early in the crop growth encouraged growers to use carry-over stocks for this purpose with variable results. In some instances, complete germination failures occurred. Germination

results were highly satisfactory when sound planting material became available about mid-autumn. Young crops established for the 1960 harvest were making good growth but those on the non-irrigated lands will require good subsequent growing conditions to ensure reasonable production.

Harvesting the 1958 Crop

Harvesting of the 1958 crop began in the Millaquin area on 2nd July, and by the end of July crushing was in progress at all the southern mills with the exception of Rocky Point which did not start until 27th August. All factories received ample cane supplies and delays were of little consequence. Crushing at most mills had finished by 23rd December. The only one continuing after the beginning of the new year was Isis which ceased on 3rd January.

Cane crushed by factories in the Bundaberg-Isis district aggregated 1,511,739 tons with an out-turn of 197,220 tons of 94 n.t. sugar. The average yield per acre taken from 61,868 acres harvested was 24.28 tons. Overproduction occurred in some mill areas and these were forced to carry-over crop for 1959.

Water Conservation

In the Isis district, where drought hazards are exaggerated by unfavourable topography the conservation of water for limited spray irrigation is receiving attention. Valleys within the cane growing area are being dammed to store the water run-off from the fields. Weirs ranging from 4,000,000 to 8,000,000 gallon storage capacity should provide a measure of crop assurance in an abnormally dry period.

Bulk Handling of Sugar

Bulk handling facilities were completed in time to receive the output from the local mills, and sugar manufactured was stored there until the official opening by The Hon. The Premier, Mr. G. F. R. Nicklin, on 20th September, when the first ship was loaded for delivery to southern refineries; regular deliveries have since been maintained.

RAINFALL RECORDS, 1915-1959

Year	*Rainfall (Inches)*		*Rainfall (Inches)*
1915–16 ..	28.54	1937–38 ..	44.40
1916–17 ..	58.08	1938–39 ..	41.01
1917–18 ..	49.85	1939–40 ..	41.69
1918–19 ..	24.24	1940–41 ..	43.26
1919–20 ..	28.20	1941–42 ..	33.52
1920–21 ..	45.16	1942–43 ..	40.75
1921–22 ..	44.97	1943–44 ..	45.22
1922–23 ..	37.14	1944–45 ..	28.14
1923–24 ..	34.16	1945–46 ..	26.10
1924–25 ..	50.96	1946–47 ..	44.52
1925–26 ..	37.62	1947–48 ..	57.76
1926–27 ..	68.18	1948–49 ..	40.18
1927–28 ..	74.69	1949–50 ..	59.31
1928–29 ..	31.16	1950–51 ..	50.74
1929–30 ..	43.16	1951–52 ..	40.42
1930–31 ..	47.19	1952–53 ..	48.99
1931–32 ..	22.88	1953–54 ..	45.81
1932–33 ..	36.81	1954–55 ..	73.95
1933–34 ..	71.45	1955–56 ..	71.13
1934–35 ..	40.01	1956–57 ..	28.01
1935–36 ..	44.24	1957–58 ..	57.05
1936–37 ..	31.65	1958–59 ..	45.24

Average for 44 years—44.49 ins.

Sugar Cane Pests

Minor damage by trichosterna and frenchi grubs occurred at Sharon and Pine Creek in November, while some damage by grubs of the Childers beetle was noted during the early summer months. Overall damage by grubs was generally light, undoubtedly reflecting the good growing conditions prevailing when grubs are normally active. Fumigation with carbon bisulphide was practised where it was considered economical, and ploughing out recommended where cane was poorly grown. Trials with insecticides were continued against the larval stages of all species, but no firm recommendation can yet be made for the use of any insecticide. The main emergence of Childers beetles did not occur until mid-December when an abnormally heavy emergence occurred in the Isis district and a heavy one in the Woongarra area.

Abstract of Meteorological Observations made at the Southern Sugar Experiment Station, Bundaberg, from 1st July, 1958 to 30th June, 1959.

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperatures						Mean Diurnal Range	Mean Temperature 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1958											
July	.29	3	81	63	69.42	57	35	45.48	23.94	59.65	78.83
August	1.09	8	86	69	74.0	65	40	52.07	21.93	62.58	73.375
September	1.56	7	81	69	75.02	66	43	53.02	22.00	68.73	74.2
October	.79	3	93	75	82.32	70	48	60.04	22.28	75.64	70.69
November	1.33	8	88	79	83.44	71	58	66.78	16.66	78.55	65.37
December	6.53	16	90	80	84.62	77	65	69.33	15.29	80.07	78.04
1959											
January	8.65	14	88	74	84.03	75	65	69.83	14.20	79.9	79.33
February	10.17	13	89	79	83.35	74	63	68.2	15.15	81.80	79.60
March	8.77	11	87	78	82.38	72	65	68.88	13.50	77.60	85.37
April	1.94	9	84	75	79.08	71	57	61.15	17.93	73.58	82.19
May	3.94	7	79	65	73.57	64	50	57.21	16.36	67.5	84.57
June	.18	4	75	64	71.35	60	38	51.0	20.35	62.1	85.32
Totals	45.24	103									

The replicated trials with BHC and aldrin against *Rhyparida* grubs were continued, with aldrin yielding promising results. Investigations on the life cycle of this insect were commenced with the emergence of beetles during the summer months.

Soldier fly larvae were again observed in association with patchy ratooning. Screening tests indicate that the larvae are not unduly sensitive to the usual range of insecticides.

The root-knot problem received further attention. Trials were established with EDB, DD and Nemagon. Population counts were made and species identified in trial areas.

Termite damage was located in widely separated locations adjacent to open forest land. Excellent control was obtained from the use of carbon bisulphide.

An increase in population is evident in sugar cane scale insects in the Isis district as a consequence of growing standover crops over a number of years. A trial has been established to determine varietal resistance to this pest.

Ratoon Stunting Disease

Cane Pest and Disease Control Boards maintained their policy of providing planting material from heat-treated stocks for the control of ratoon stunting disease, and made a distribution to growers from these sources during the spring and autumn planting periods.

Chlorotic Streak Disease

Chlorotic streak disease does not appear to have extended beyond the poorly drained lands. Some occurrence of the disease has been noted on these lands in crops grown from hot-water treated stocks.

Mosaic Disease

The mosaic disease incidence is at an all time low, which is highly gratifying when it is remembered that a high proportion of the crop is the susceptible variety N.Co.310. This situation reflects the good work performed by the inspectional staff of the Bundaberg Cane Pest and Disease Control Board.

Distribution of New Variety

During the spring of 1958, disease-free stocks of Q.58 were made available to growers for general planting. A total of 254 tons was distributed among 195 cane growers.

EXPERIMENT STATION ACTIVITIES

Isolation Nursery, Beerwah

A total of seventy-one canes was transferred from the Station to the Beerwah isolation nursery for ultimate planting and trial in the Moreton district. These include 1953, 1954 and 1955 series seedlings and canes introduced from other countries.

Replicated Randomised Trial

Two replicated randomised trials were harvested during the year. The ratoon trial contained 1953 series seedlings and six of these showed sufficient promise to warrant propagation on a district farm. Several showed promise in the plant trial with 1955 series seedlings. These have been ratooned and will be subject to selection before harvest in 1959.

Old and New Canes Compared

The ratoon crops of three such trials were harvested and the resultant figures indicate that in all cases, in disease-free crops, the new varieties are superior. A summary of the three experiments is as follows:—

Variety	Cane per acre Tons	Sugar per acre Tons
	3 crops	3 crops
N.Co.310	94.8	15.05
Vesta	96.8	13.73
C.P. 29/116	103.9	13.61
Q.50	98.7	14.52
Q.47	90.4	12.59
P.O.J. 2878	77.5	10.61
M.1900	61.9	8.25
Q.50	101.0	17.21
Q.47	98.4	15.92
C.P. 29/116	95.8	14.35
Q.49	90.6	14.19
Co.281	74.3	12.24
Co.290	86.9	12.19
P.O.J.2725	70.3	11.21
Q.813..	66.5	10.80
M.189	58.7	8.67
	2 crops	2 crops
Q.50	56.1	8.31
C.P.29/116	54.1	9.80
Q.47	55.4	7.48
P.O.J.2714	41.0	5.88
D.1135	42.4	5.87

This is another new cane—Q.72—for the Isis district.

Red Rot-Ratooning Trial

All seedling canes selected for inclusion in the replicated yield observation trial were included in this trial which was planted in 1957. Examination of canes before harvest did not reveal the occurrence of red rot, and all ratooned satisfactorily.

Ratooning Trial

Widespread poor ratooning has caused some concern throughout the district for the past few years and, in an endeavour to determine the effect different times of harvest would have on the ratooning ability of a known affected variety, a block on the Station was set aside for this

Progenies of various cowpea crosses being multiplied at Bundaberg.

Hand weighing a field trial in South Queensland.

purpose. Portion of the block was harvested each two weeks for the greater part of the season but ratoon shoots came away normally in all instances.

Permanent BHC Toxicity Trial

The first ratoon crop of the second cycle was harvested during the year. This trial was established in the autumn of 1952, and BHC—refined (88 per cent. gamma isomer) and crude (1.3 per cent. gamma isomer)—has been applied to all crops to determine whether continued, heavier than normal applications of this insecticide would retard crop growth. Grubs do not normally occur on the Experiment Station, so any reduction in yield could be attributed to toxic effects from the insecticide. There is no evidence that BHC has affected yields, as no significant differences have been recorded in any of the crops harvested to date.

Legume Breeding

As part of the cowpea breeding project initiated at Meringa Experiment Station the progeny of several crosses, in their fourth generation, were planted in plots for seed purification. The cross C.P.I.12153 x Malabar gave exceptionally long cover, extending into mid winter. Seed from all crosses was harvested for replanting. Ultimately, when pure lines have developed, the best varieties will be selected for multiplication.

New Trials Established

A row spacing trial was planted during the autumn of 1959 employing four varieties with three row interspaces. It is felt that information on the interspace-yield relationship may be of assistance in the development of mechanical harvesting machines.

One of the efforts being made to conserve water for irrigation in the southern district.

Two 5 x 5 latin square trials with N.Co.310 and C.P.29/116 were planted for the purpose of determining the influence of nitrogen on c.c.s. Five levels of sulphate of ammonia will be used, and regular c.c.s. samples will be taken.

Annual Field Day

Annual Field Day which was held on 20th June was attended by some 550 cane growers, mill officials and other persons interested in the sugar industry. All visitors were shown some of the investigations receiving attention.

Laboratory Work

Following is a summary of cane and water samples tested during the year—

Station and trial cane samples	1,814	
Farmers' cane samples ..	676	
		2,490
Irrigation waters		62

Summary of Crops Grown on Station

	Tons.
Seedlings	342.75
C.P.29/116	47.25
Co.290	7.025
N.Co.310	25.025
Pindar	5.25
P.O.J.2878	15.1625
Q.47	181.7125
Q.49	68.625
Q.50	174.8125
Vesta	20.0
Mixed	60.3125
	947.925
Plant cane harvested	354.3625
Ratoon cane harvested	593.5625
	947.925
Total cane harvested for mill ..	925.125
Used for samples and plants ..	22.8
	947.925
Total acreage harvested ..	27.239 acres
Average tonnage per acre..	34.8 tons

The 1958 batch of seedlings grew luxuriantly in the glasshouse.

Division of Plant Breeding

J. H. Buzacott, Senior Plant Breeder

Introduction

The cane breeding programme has for some time been undergoing a phase of expansion and is now reaching a position of greater stability from which we can look forward to results with greater confidence. As a result of streamlining the technique used in cross-pollination, a much larger number of crosses can be handled with comparatively little increase in the units of labour used; and even the greatly increased selection rate has, by careful organization, been handled with a relatively small labour staff. Many of the experiments conducted have paid dividends and, as a result, such techniques as increased selection rates from original seedlings and early randomisation of selections have been incorporated into the normal breeding programme. With the conclusion of experimental work on these projects other investigations can be conducted and it would appear that an improvement in the future varietal picture can be confidently anticipated.

Cross-pollination

Flowering in 1959 was early and rather free. It was an unpleasant year for cross-pollination due to continual wet weather which rendered working conditions most uncomfortable. During the period from the 15th May to the 30th June rain fell on no less than 38 days. Whether the rainy weather affected pollen viability or seed set will not be fully known until the seed is germinated during late July and August. Results to hand at the time of writing this report indicate that good germination can be expected.

Very many more crosses were made in 1959 than during the difficult season of 1958. Commencing with the first cross on the 15th May, the last cross was set up on the 2nd July for a total of 416 crosses. Included in this total were six large area crosses to ensure a plentiful supply of seed of the most valuable combinations.

Seedling Raising

Good seed germination was experienced in 1958 at all stations and there is no doubt that seed-set in the 1958 cross-pollination campaign must have been excellent. The growth of the young seedlings in the flats filled with the mill filter cake compost, as mentioned in last year's annual report, was again excellent and there were sufficient seedlings produced at three stations to enable areas to be devoted to bunch planting.

At Meringa, 8,029 seedlings were single planted and 35,860 were planted in bunches giving an approximate total of 44,000 seedlings. At the Burdekin there were 6,119 single-planted seedlings and 6,870 in bunches giving a total of 13,000 seedlings. At Mackay the total was 10,700 seedlings made up of 8,336 single-planted and 2,630 in bunches whilst at Bundaberg 5,827 seedlings were single-planted. Thus an approximate grand total of 73,500 original seedlings was planted in 1958 at the four stations.

Selection

Selections from the 1957-series seedlings were made at Meringa during July, 1958 when 1,113 were selected from 47 families; at the Burdekin in June when 144 were chosen from 28 families; at Mackay in July when the number selected was 456 from 58 families; and at Bundaberg in August when 153 seedlings representing 24 families were selected. In addition to these a further 1,600 were selected from bunch-plantings at Meringa and at Mackay.

In the next stage of selection 238 seedlings of the 1956-series were selected at Meringa and planted in 30-sett plots. This was part of an experiment on selection rate. In addition twenty-one 1954-series seedlings were planted in a lattice square trial. A replicated yield-observation trial at the Lower Burdekin Station included twenty-seven 1956-series seedlings; at Mackay forty-three 1955-series seedlings, which included 13 selected for rich land, reached a yield-observation trial,

The seedling pots on tables outside the glasshouse are filled with soil for subsequent transplanting of the young seedlings.

whilst at Bundaberg nine 1956-series seedlings were selected for a yield-observation trial and 36 of the same series were planted in 40-sett plots either as selections from 6-sett plots or repeats from the previous year's 40-sett plots.

Sub-stations

The major sub-stations at Bartle Frere and Mourilyan were continued. At the former, where richer soil was available for planting, only better land types were selected and, as a result, fifteen 1954-series seedlings were planted in a yield-observation trial. At Mourilyan, 1,113 seedlings from the Meringa 1957-series were planted in 2-sett plots, 167 varieties of the 1955- and 1956-series were planted in 10-sett plots, 46 selections from the sub-station and 21 from Meringa were planted in 30-sett plots, and 20 selections from the sub-station were planted in 180-sett plots. This latter sub-station, which caters for the needs of the wet belt, is now functioning well and is expected to yield valuable new varieties in the near future.

Other areas are served by large scale introduction plots at Beerwah and Maryborough in the south and Ingham in the north. It is proposed to extend the scale of activities at Ingham during the coming year and arrangements are in hand to establish large scale introduction plots at Tully and Childers.

Marcotting

Compared with solution crossing, which has been so effective in Queensland, the method of marcotting, as used extensively in some countries, seems cumbersome and labour-consuming. Nevertheless the method could sometimes prove useful here for crossing varieties which do not keep well in solution and also possibly for self-pollination. Accordingly some experimental marcotting was performed this season using alkathene tubes and three types of filling material viz., German peat moss, sphagnum moss and soil. Rooting was far better and more rapid in the German peat moss, whilst the least effective material was soil. Subsequent transplantation of the marcot was affected without difficulty.

Maleic Hydrazide

Maleic hydrazide has for several years been used to delay arrowing of certain varieties at the Northern Sugar Experiment Station and it has proved a very useful method to effect synchronisation of flowering in some crosses. Some recent work published in other countries indicates that the authors have not been able to achieve the results obtained in Queensland with maleic hydrazide. Towards the end of January 1959, which is slightly earlier than usual, the maleic hydrazide treatment was again applied to a number of varieties at the Northern Sugar Experiment Station. The flowering of N.Co.310 and Eros was definitely delayed by the treatment but the flowering of some other varieties was unaffected. The time of spraying may be a critical factor for some varieties.

This new thick variety, 54C241, is undergoing rich land trials at Mackay.

Modified Solutions

During the 1959 cross-pollination period extensive tests were made of two modified solutions reported from Hawaii as being superior to the sulphurous acid-phosphoric acid solution which has now been in use for a number of years for keeping cane arrows alive during cross-pollination. Due to the cool, cloudy weather experienced, flowers kept very well in the standard solution and slightly better in the modified solutions. These solutions will be tested further in subsequent years in order to see what effect they have in a year when cross-pollination conditions are more difficult and when death of arrows in the standard solution is more common.

Lantern Protection

The 168 cloth lanterns which are used to prevent contamination during cross-pollination are costly to replace. In order to protect them from rotting an alum-lead acetate treatment was tested this year. This is claimed to waterproof the material without clogging the pores. Apart from the preservation of the lanterns it is essential that any treatment applied should not affect seed development or subsequent germination. An experiment designed to test these two factors was set up and, from seed already germinated, the treatment appears to have had no deleterious effect on seed-set or germination. Whether lanterns so treated will last longer only time will determine.

Selection Experiments

Experiments designed to indicate the most profitable selection rate strongly favoured the interpolation of a 4-sett plot between the original seedlings and the 30-sett plots, and this practice is now being introduced at all stations. The selection rate now aimed at is ten per cent.

Bureau research officers at Meringa combine with research officers from other organizations in a cane breeding seminar at the Experiment Station.

selection in original seedlings of which approximately one-fifth of the highest rated selections are planted straight into 30-sett plots, whilst the remainder are planted in 4-sett plots.

A certain amount of experimental work was also done on border competition in 2-sett, 4-sett, 10-sett and larger sized plots. These investigations are still in progress.

Miscellaneous Experiments

Small experimental samples of pollen were stored under low temperature conditions for two months and used in cross-pollination. The result of these experiments will not be known until later in the year when the seed produced, if any, is germinated.

An experiment to test gravimorphic effects on flowering was conducted on potted stools of cane which were available from another experiment. Stalks kept in a horizontal position flowered more freely than the controls. The material was such that no great reliance could be placed on the results which, however, were so encouraging that a further trial was established. The canes in this second trial showed no floral initials but it is quite likely this trial was commenced too late in the season for the development of flowers. In view of the promise of the earlier experiment it is intended to repeat the trial next year with strictly comparable material and commencing at an earlier date.

Seedling Numbering

All new varieties selected as commercial canes receive " Q " numbers before approval. During the course of development of new varieties for the industry many thousands of individual selections have to be handled and identified. In the past an index letter was used to denote the year in which each variety was produced and an allotment of numbers was made to each of the four experiment stations so that varieties would retain the identity of the station at which they were originally selected. Due to the reorganisation of cane breeding, and the far greater number of selections now made, this method became impracticable ; so during the past year a new method of nomenclature for seedlings, prior to their approval for commercial purposes, was introduced. This system consists of using the last two integers of the year in which the seedlings were first planted in the field, followed by an index letter for each station, " N " for Northern, " A " for the Lower Burdekin, " C " for Central and " S " for Southern. These two figures and letter are followed by the serial number of the selection which is allotted in order as selected from an original seedling. Thus 58S15 would be the number of the fifteenth seedling selected at Bundaberg from seed sown, and accordingly first planted in the field, in 1958. Varieties selected purely for parent canes are allotted the letter " B " instead of one of the other four letters. When varieties are selected on sub-stations but not on the major station of the district a lower case letter is introduced as, for instance, 57Ni45 would be a seedling selected at the Innisfail sub-station from seedlings which were originally

N.685 is a promising variety raised at Meringa from Hawaiian seed.

Packing sugar-cane fuzz in polythene bags during the 1959 cane breeding season at Meringa.

planted at the Northern Sugar Experiment Station in 1957 and introduced to the Innisfail sub-station without prior selection the following year.

New Land

A serious limiting factor in the expansion of the cane breeding work in the past has been an insufficiency of suitable land. In order to provide more uniform land for varietal selection work, thirteen acres of land adjoining the Northern Experiment Station was acquired in 1958. This was bulldozed and some six acres have so far been ploughed. It is planned to use one and a half acres for planting trials in 1960 and this amount will be increased each year until the full area required to accommodate the seedling selection programme is planted.

Legume Breeding

The legume breeding work was continued at the Northern Sugar Experiment Station by the agronomist. Further crosses were made during September, using as parents the varieties, Black Eye No. 5, Buff, Havana, Malabar, Reeves and Santiago, as earlier work indicated that these varieties produced the most promising progeny.

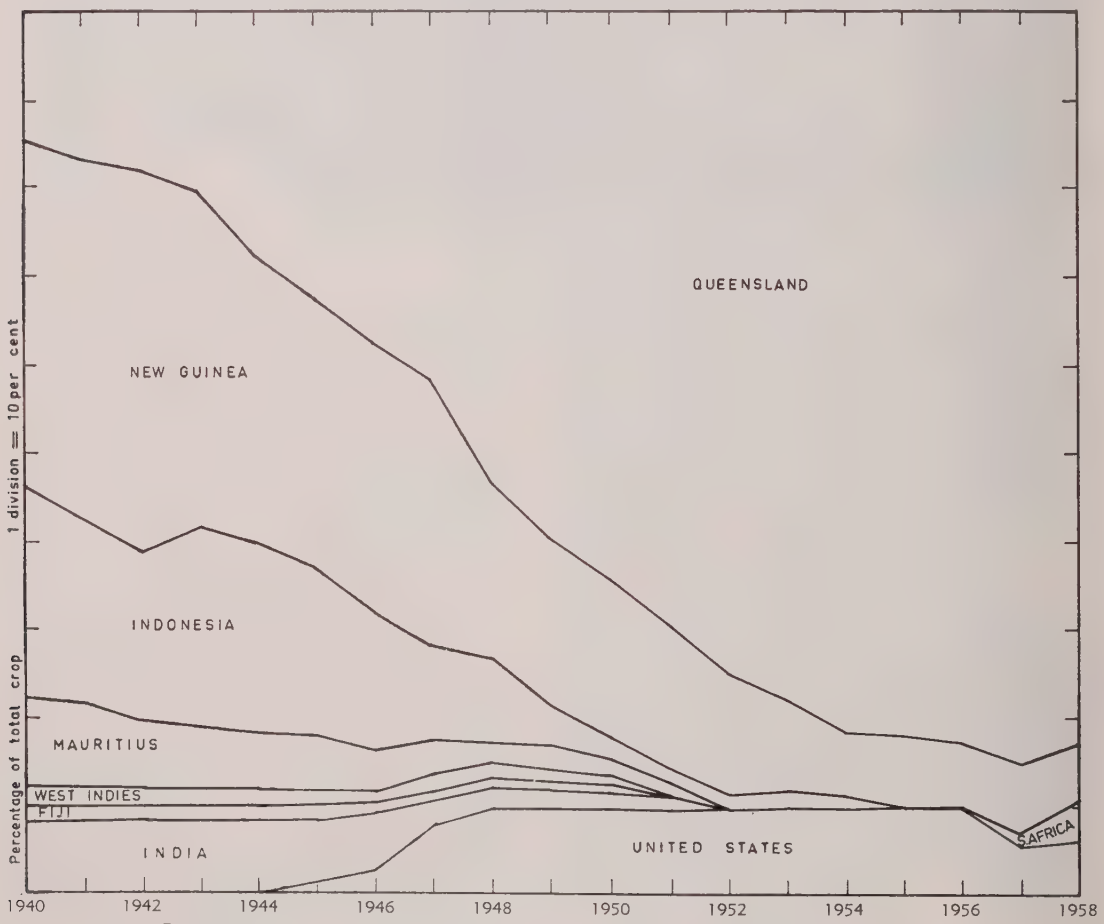
At all four stations seed from the most promising families of the earlier made crosses was harvested, and bulk planted. The F5 generation has now been reached. In addition, at Meringa, F5 seed from single plants was planted in 10-plant plots during December, 1958. A total of 524 varieties was planted in this manner and, in comparison with standard cowpeas, 143 of this number rated a higher score than the standard. This result is considered very promising. The families which gave the best performance were Havana x Black Eye No. 5, Havana x Malabar, Malabar x Black Eye No. 5 and Malabar x Buff. Selections have been allotted a number prefixed by the index 58NL. The " 58 " indicates the year they were made individuals, the " N " indicates the Northern Sugar Experiment Station

and the "L" is to distinguish them from sugar cane varieties which receive a similar index in their early stages of selection.

Varietal Statistics

The total crop harvested in 1958 was slightly in excess of 9,700,000 tons but a large tonnage was left unharvested due to lack of available markets. This fact influenced to some extent the ranking of some of the varieties and, in particular, the relative position of the two major varieties in the state. In reviewing the situation it must be remembered that by far the greatest amount of unharvested cane was left in the central district and the Burdekin district. It is estimated that the Mackay mills had some half a million tons of excess cane, the greater portion of which was Q.50, whilst in the Burdekin mills most of the unharvested cane would be Trojan.

Approximately 2,200,000 tons each of Q.50 and Pindar were harvested but the amount of Pindar exceeded that of Q.50 by 3,424 tons. It is obvious that, although there was some Pindar left unharvested in some of the northern mill areas, the amount was relatively low and the tonnage of Q.50 grown exceeded that of Pindar by at least 300,000 tons. This would make Q.50 for the sixth time in succession the leading variety in Queensland. It is also the first time that Pindar has achieved the honour of being the leading variety in the state from the point of view of tonnage harvested. Together the two varieties produced 45 per cent. of the total state crop, although Q.50 is rapidly falling in percentage



Composition of the Queensland crop on the basis of country of origin.

grown in the Mackay district where only 65 per cent. of the crop is now represented by this variety.

Of the third ranking variety, Trojan, almost one and a half million tons were harvested, which represented 15 per cent. of the state crop, and two-thirds of this total was grown in the Burdekin district. Badila, C.P.29-116 and Q.58 were in the fourth, fifth and sixth positions, the same as the previous year, but the tonnage of Q.58 harvested increased by 200,000 tons to exceed a half million tons for the first time. It is believed that Q.58 will in 1959 displace both C.P.29-116 and Badila and its tonnage should approach the one million ton figure.

Both N.Co. 310 and Q.57 showed tonnages of over 400,000—a marked increase over the previous year. The former displaced Q.57 for seventh place by a small margin. N.Co.310 has extended in the central district, and more than 60,000 tons of it were produced there in 1959. On the other hand Q.57 has shown some recession in the Burdekin district but has almost doubled in tonnage north of Townsville, a fact which can be attributed to its popularity in the Babinda district. In the near future there will be a great increase in the area devoted to Q.57 in the Innisfail, Tully and Ingham districts due to its ability to attain a good sugar content in wet and cloudy situations and also for its characteristic of withstanding lodging and the fact that in wet weather it can easily be cut green.

Vesta achieved ninth position with Q.44 and Vidar filling tenth and eleventh places respectively. Q.47 was the only other variety on the list to reach one per cent. of the total Queensland crop. It is grown only in the Bundaberg district and represents five per cent. of the crop in that area. Of the remaining 28 varieties listed, some have fallen badly out of favour whilst others have grown in popularity. The greatest improvement in position was made by Q.59, which advanced from twentieth position to thirteenth, Q.61 which moved on from twenty-fourth to fourteenth, and Q.63 which from twenty-ninth place in 1957 achieved twentieth in 1958. Q.66 and Q.65 also showed rapid development, 18,000 tons of the former being harvested on rich land in the far north and 13,000 tons of the late maturing Q.65 being harvested in the central district. Q.68 also improved in position whilst Q.70 and Castor appeared on the crushing lists for the first time.

Varieties which declined in popularity included Q.28, Comus, Eros, S.J.16 and P.O.J.2878 of the still important ones, and H.Q.426, Q.49, Q.45, E.K.28 and Co.290 amongst those of lesser importance. The two lastmentioned varieties, both important canes of twenty years ago, are now the lowest ranking varieties listed and appear destined to appear only amongst " other varieties " in the very near future. H.Q.426, more popularly known as " Clark's Seedling ", also is not far behind them and, from the position of fourth in importance in 1942, has now fallen to thirty-third place. Of the newer varieties, Q.66 in the far north, Q.63 and Q.68 in the central district and Q.61 in the south are expected to progress rapidly, whilst Q.67, recently approved in the Burdekin district, should shortly appear in the harvesting lists.

Queensland-bred Canes

The percentage of Queensland-bred canes showed a slight diminution in 1958 when it dropped to 82.2 per cent. from 85.5 per cent. recorded in 1957. Actually the figure would be better related to the percentage of 81.3 represented in the 1956 crop as the 1957 value was inflated due to the serious drought in Bundaberg which reduced very considerably the tonnages of

The polythene bags of cane fuzz being sealed with an electric sealer prior to deep-freeze storage.

The cross pollination season in full swing. Individual crosses are segregated in calico-covered crossing lanterns.

An experiment in gravimorphism to influence the flowering of breeding canes.

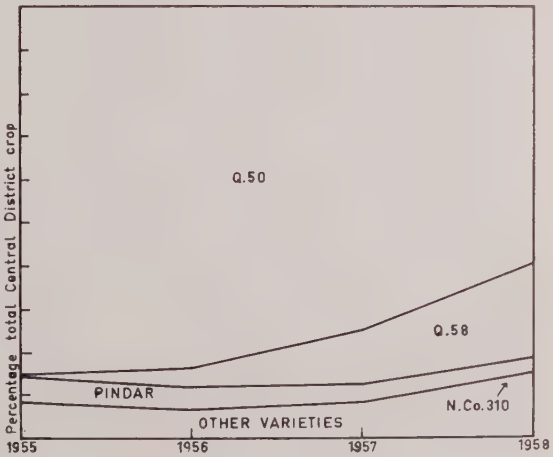
Transporting arrows for cross pollination. They are loaded carefully in a utility truck.

C.P.29-116 and N.Co.310. These are the two major varieties grown which are not of Queensland origin. The gradual recession of C.P.29-116, which has been occurring during the past few years, is being offset to some extent by the extension of N.Co.310 in the Mackay district. However, it is an undoubted fact that the C.P. variety is now really suffering from the assaults of such varieties as Q.50, Q.58, and Q.61 and, with the anticipated approval next year of "Q" varieties suitable for the Childers district, it is believed that the U.S. variety, which at present comprises 29 per cent. of the southern crop, will soon be displaced as major variety of the south. Indeed, Q.50 with 19 per cent. and N.Co.310 with 20 per cent. of the southern crop are already seriously challenging it.

New Guinea varieties still rank second in importance with Badila, the only representative, still maintaining approximately six per cent. of the state crop. Providing slightly less than six per cent. the United States, also represented by one variety, C.P.29-116, is still in third position as provider of our varieties but is now closely challenged by South Africa, another country with a single representative, N.Co.310, which now represents 4.7 per cent. of the state crop. Indonesia, represented by two varieties P.O.J.2878 and E.K.28, which in the past ranked with the most important, is now only represented as a third of one per cent. of the crop. In 1958, only 33,000 tons of P.O.J.2878 were harvested and 2,500 tons of E.K.28. Although varieties developed in India, the West Indies and Mauritius still show in the harvesting list, only very small tonnages of them were crushed and within the next few years they will disappear from the varietal picture.

New Varieties

For planting in 1959, Q.67 has been approved for the Burdekin mill areas. This variety, of the parentage Q.27 x Q.31, has shown high early sugar and resistance to lodging. Its somewhat slow germination and susceptibility to the top rot phase of red stripe disease will militate to some degree against its wide use; nevertheless, it should prove a welcome addition to the Burdekin approved list, particularly for use on



Illustrating the gradually reducing percentage of Q.50 in the central district.

the richer soils where Trojan lodges. Q.68 was approved for the mills of the central district. Developed from P.O.J.2878 and Co.290 this variety produces well on very poor soils and already shows signs of popularity in Mackay. It could also prove useful for the poorer soils of other parts of the state. Co.475, a vigorous Indian variety, was also approved for Mossman, Mulgrave and Babinda areas. The approval of this variety was held up for a number of years until more information regarding its reaction to red rot was gleaned. In the far north there seems little risk of this disease causing economic losses in the variety, and its capacity to yield well on very poor soils will be appreciated by farmers with these soil types.

The range of approval for four other varieties has been extended. Vidar is now approved for growing in Mossman; Q.58 has been placed on the approved list for the Ingham mills and for those at Bundaberg; whilst Q.57 has been listed for growing in the central district, where it will be grown on the river soils; and Q.70 has been approved at Moreton.

Present indications are that still more new varieties will be approved in 1960 and already allotments have been made of four new " Q " numbers. These are Q.69 which has been given to the variety " H.25 ", a Co.281 x C.P.29-116 seedling, which shows promise in the Childers district. For the same district " H.46 ", of the parentage Co.281 x P.O.J.2878 has been allotted Q.72. The variety " L.77 ", a high sucrose cane developed from Co.270 x P.O.J.2878, will now be known as Q.71; it is expected to be approved for Moreton and Maryborough next year. Whilst Q.73 has been allotted to the central district variety formerly known as " I.106 ", another high sucrose variety which has performed well at Mackay. Its parentage is Trojan x Eros.

The marcotting technique is not used in the Bureau's cane breeding; but it can be done successfully if required.

TABLE VII

Countries of Origin : 1958 Crop.

Country of Origin	Tons of Cane	Per cent
Queensland	8,036,326	82.49
New Guinea	634,024	6.51
United States	572,468	5.88
South Africa	460,463	4.73
Java	35,768	0.37
India	1,746	0.02
	9,740,795	100.00

Table VIII

1958 Season

Varietal Composition and Distribution in the Four Main Districts and in the State as a Whole—1958 Crop

Variety	North of Townsville		Burdekin and Giru		Proserpine and Mackay		Bundaberg and South		Whole State	
	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%
1. Pindar	1,832,249	46.2	135,651	10.4	93,158	3.6	142,423	7.5	2,203,481	22.6
2. Q.50	149,388	3.8	14,858	1.1	1,675,652	65.4	360,159	18.9	2,200,057	22.6
3. Trojan	547,632	13.8	927,409	70.9	21,168	.8	..	..	1,496,209	15.4
4. Badila	594,575	15.0	37,070	2.8	2,379	..	..	..	634,024	6.5
5. C.P.29/116	..	..	..	..	16,052	.6	556,416	29.2	572,468	5.9
6. Q.58	1,390	..	..	..	546,470	21.3	652	..	548,512	5.6
7. N.Co.310	..	..	..	..	65,448	2.6	395,015	20.7	460,463	4.7
8. Q.57	283,537	7.2	146,192	11.2	9,427	.4	..	..	439,156	4.5
9. Vesta	..	..	..	..	..	..	156,974	8.2	156,974	1.6
10. Q.44	122,843	3.1	..	..	..	..	..	..	122,843	1.3
11. Vidar	112,886	2.8	..	..	..	..	..	..	112,886	1.1
12. Q.47	..	..	..	..	..	..	93,481	4.9	93,481	1.0
13. Q.59	78,134	2.0	..	..	..	..	..	..	78,134	.8
14. Q.61	..	..	..	..	..	..	74,954	3.9	74,954	.8
15. Q.55	..	..	..	..	..	..	58,995	3.1	58,995	.6
16. Q.28	..	..	..	..	36,705	1.5	16,489	.9	53,194	.5
17. Comus	30,981	.8	6,129	.5	6,109	.2	..	..	43,219	.4
18. Eros	40,802	1.0	..	..	..	..	..	..	40,802	.4
19. Ragnar	38,439	1.0	..	..	..	..	..	..	38,439	.4
20. Q.63	..	..	..	..	36,793	1.4	..	..	36,793	.4
21. S.J.16	..	..	34,877	2.7	..	..	..	..	34,877	.4
22. P.O.J.2878	266	..	..	..	10,821	.4	22,179	1.1	33,266	.3
23. S.J.4	25,199	.6	..	..	..	..	..	..	25,199	.3
24. Luna	22,732	.6	..	..	..	..	..	..	22,732	.2
25. Q.66	18,637	.5	..	..	..	..	..	..	18,637	.2
26. Sirius	15,846	.4	..	..	..	..	..	..	15,846	.2
27. Q.56	..	..	..	..	15,251	.6	..	..	15,251	.2
28. Q.65	..	..	..	..	13,644	.5	..	..	13,644	.1
29. Cato	11,190	.3	..	..	..	..	..	..	11,190	.1
30. Q.70	..	..	..	..	..	..	9,224	.5	9,224	.1
31. Q.64	9,152	.2	..	..	..	..	..	..	9,152	.1
32. Q.51	..	..	..	..	..	..	7,977	.4	7,977	.1
33. H.Q.426	6,716	.2	985	..	..	..	..	..	7,701	.1
34. Q.68	..	..	..	..	7,540	.3	..	..	7,540	.1
35. Q.49	..	..	..	..	..	..	5,399	.3	5,399	.1
36. Castor	5,135	..	..	..	..	..	..	..	5,135	.1
37. Q.45	..	..	..	..	2,543	..	..	..	2,543	} .2
38. E.K.28	..	..	546	..	1,956	..	..	..	2,502	
39. Co.290	..	..	..	..	363	..	1,383	..	1,746	
40. Others	14,173	.5	4,294	.4	1,555	.4	6,128	.4	26,150	
	3,961,902	40.7	1,308,011	13.4	2,563,034	26.3	1,907,848	19.6	9,740,795	100.0

Wireworm damage in the Mackay district following sub-standard dressing of BHC.

Report of the Division of Entomology and Pathology

R. W. Mungomery, Assistant to Director

General

Fortunately no serious outbreak of any cane pest or disease occurred during the 1958-59 season, and losses remained at the comparatively low level which has been characteristic of the past few years. However, this satisfactory state of affairs should not engender any feeling of complacency since over-production, to the extent of 10-15 per cent. of what our available markets can absorb, could have an adverse influence on the pest and disease situation in the near future, unless adequate measures are taken to counter any such tendency. It is well, therefore, to look ahead and attempt to forestall what is likely to happen if production is not maintained in closer conformity with peak tonnages of the various mills.

It is axiomatic that excess production involves either the destruction of crops surplus to mill requirements or the standing-over of those crops. In all areas the destruction of crops, and the incorporation of crop residues in the soil, usually brings about an increased incidence of pine-apple disease; so subsequent plantings should be protected by suitable organic mercurial fungicides. In North Queensland, standover crops are prone to be damaged by cyclonic winds and rain, while various internal stalk rots, borers and rats add their quota of destruction. In South Queensland, standover crops afford scale insects and grubs every opportunity to increase, while red rot and rind disease are added risks that the grower must accept.

The satisfactory standard of control maintained against the greyback grub pest has served to highlight the activities of other grubs, some of which have proved to be hitherto unnamed species. Their presence in pest proportions may be due either to their greater resistance to BHC in fields where they previously co-existed with greyback grubs or to their preference for some of the

newly-opened forest areas to which the sugar industry expanded during the last decade. Present investigations are aimed at determining the life histories of these new grubs, and their reactions to various soil insecticides, so that control measures can be applied on a more rational basis. However, losses due to all species of grubs amounted to only 1,165 tons of cane, which is the lowest figure ever recorded, and this must certainly give cause for the utmost satisfaction.

The use of lindane for greyback grub control has not increased to the extent that might have been anticipated from a consideration of the cost margin below that of the corresponding quantity of crude BHC dust. Nevertheless, three machines for spraying lindane on the soil were operating in the Burdekin district in 1958, and several hundred acres were treated in this manner. A number of Cane Pest and Disease Control Boards in other districts have evinced interest in applying lindane as a spray during the coming season. Demonstration plots did not illustrate the efficiency of the spray treatment because of lack of grub infestation, and this, combined with the conservative attitude of many growers, has doubtless militated against the wider adoption of lindane for cane grub control.

The same trouble in locating infested areas in the Bundaberg and Isis districts resulted in the majority of the experimental plots yielding little or nor data on grub control but, in one trial, broadcast applications of BHC and aldrin were each showing some measure of control against the Childers grub. Even if it were demonstrated that soil insecticides were effective against these southern species, the low proportion of fields and area actually infested to any serious degree, and the difficulty in anticipating where moderate to heavy infestations are likely to occur,

Wireworm trial showing lindane treatment in background and untreated control in foreground.

are factors which would almost certainly preclude this form of control from being an economic one.

Lindane, however, may have greater immediate appeal for wireworm control, and fertilizer companies have already made lindane-fertilizer mixtures available for this purpose. Experiments carried out during the year indicated that crude BHC, lindane and aldrin each effectively prevented wireworm attack when applied with fertilizer at planting time. Because of the smaller quantity of lindane required in comparison with crude BHC, the former is less likely to produce any appreciable phytotoxic effect when applied near the setts. Nevertheless experiments showed that a mixed NPK fertilizer temporarily inhibited root development when applied in direct contact with the setts, irrespective of whether it contained added insecticide or not; so emphasis has been laid on the importance of allowing the setts to be covered by half an inch of soil before delivering the insecticide-fertilizer mixture on top of them. In an attempt to circumvent the phytotoxic effect of direct applications of BHC-fertilizer mixture on the setts, some growers adopted the expedient of reducing the quantity of BHC in their mixtures by half, but these sub-standard dressings of BHC did not prevent considerable wireworm damage from developing.

Rat damage was less than in past years but this was due, for the most part, to the drier conditions which caused a higher rate of natural mortality and allowed harbourages to be fired or cleaned up. Damage from these pests, however, although varying from 0.1 to 0.7 per cent. of the total Queensland crop from year to year, is usually sufficient to attract comment in certain mill areas, and investigations into the biology and habits of the smaller khaki rat would doubtless place control operations on a sounder footing. Some work on bait containers gave promise that

Rat damaged Q.50 at North Eton.

glassine packets may induce a better take of bait.

The annual conference of Cane Pest and Disease Control Boards was held in Cairns on 8th April and the 57 delegates who attended were drawn from every Board in Queensland. Additionally, several Bureau officers were present in an advisory capacity. Problems dealt with included the control of cockatoos, wallabies, wireworms and cane grubs while, on the disease side, the status of Q.66, a review of the campaign against ratoon stunting, and the hot water treatment of full stalk lengths of cane, were items which evoked lively discussions. Delegates also expressed their appreciation of the Government's plan to spend £50,000 in the control of the giant sensitive plant, but they requested the speedy enactment of legislation to prevent the removal of sand and gravel from seed-infested areas. On the day following Conference a tour was made of the Mossman and Mulgrave areas where local pests and diseases were inspected, and these proved of outstanding interest to visiting supervisors.

Little progress was made in elucidating the problem of poor ratooning in the Bundaberg district largely because this trouble was absent from many of the farms where these ratoon failures had been occurring in previous years, and it was on these farms that most of the experimental plots were concentrated. However, soil samples taken from a number of ratoon fields with good and poor growth patches failed to show any consistent pattern in the incidence of soil microfauna except in the case of nematodes whose activities are dealt with at greater length in the report of the Division of Soils and Agronomy. Apart from this qualification, other soil microfauna do not appear to be implicated in ratoon failures to an important extent.

Many poor ratoons occurred in early harvested fields, but these improved as the season progressed. In other instances soldier fly larvae were associated with an extension of the trouble at North Kolan and Rubyanna, while *Rhyparida* larvae were responsible for damage in several very localized areas in South Kalkie. Investigations carried out on *Rhyparida* revealed the conditions under which egg-laying and hatching occur, and served to fill in the gaps which previously existed in the life history of this pest.

Over-production has brought in its wake a number of problems to some of the Cane Pest and Disease Control Boards that have established plots of hot water treated cane to meet their growers' clean seed requirements. In many instances growers have succeeded in disposing of a portion of their surplus cane as clean planting material by under-cutting the price set by Boards for their more recently treated and more reliable stocks; and, because of this unforeseen development, Boards have been finding it more and more difficult to get rid of their clean cane. A partial solution to this problem would be for Boards to reduce the size of their future plantings so as to produce a tonnage more in keeping with anticipated demands which, however, are difficult to predict even approximately from one year to the next. The alternative and perhaps better approach would be for Boards to continue with their normal planting programmes, and to subsidize the sale of their planting material to an extent that will preclude the possibility of any serious competition developing from outside sources. Where this latter policy has been followed, it has ensured that the major portion, if not the whole, of the Boards' clean seed stocks has been utilized.

In general, the campaign fostered by the Bureau to utilize clean seed for planting purposes proceeded satisfactorily, particularly in respect of ratoon stunting disease. Practically all cane that was planted during the year was derived from stocks that, at some previous stage, had received a long hot water tretament. Emphasis was laid on the desirability of using recently treated cane in preference to the earlier treated cane, some of which was found to have become contaminated over the years through the agency of knives and implements used in adjacent fields of diseased cane. In one instance, however, legal proceedings had to be taken against an uncooperative grower who was fined and obliged to destroy the diseased cane he had planted.

Unfortunately no progress was made in reducing the area infected by chlorotic streak, and the disease must now rank as the foremost in causing losses to Queensland's annual cane crop. The heaviest infections occur in the high rainfall areas, particularly where the soils are poorly drained or remain moist for long periods, and the only hope for any marked improvement in the position appears to lie in a better understanding of the manner in which the disease is spread.

The first success in this direction came during the year when several transmissions were obtained in preliminary glasshouse experiments in which healthy cane was grown in nutrient solutions circulating between diseased and healthy plants, but in this case insects were not specifically excluded. This work closely parallels results obtained on this disease in Hawaii, Puerto Rico and Mauritius. Since then, investigations on chlorotic streak have been accorded top priority in the pathology section, and the volume of experimental work has been stepped up appreciably. In addition, an agronomist has been co-opted to assist in the field studies of this disease, which are designed to determine the most sensitive varieties for displaying symptoms, the optimum conditions for the development of symptoms, and the extent of the curative effect (if any) obtained by growing diseased cane under comparatively dry, well drained conditions.

The drive against mosaic in the Mackay district resulted in a decreased incidence of this disease, but the prolonged rainy season disrupted the work of the field gangs somewhat. Inspections and roguings of diseased stools were carried out in accordance with a pre-arranged schedule, and growers assisted by taking their planting material from fields which inspectors had classed as healthy. The results of this campaign should get progressively better over the years, but already it has halted the threat to the somewhat susceptible varieties, Q.50, Q.58 and N.Co.310, which together comprise the bulk of the cane grown in the central districts.

Leaf scald continued to cause embarrassment in the wetter areas, particularly since some of the less susceptible, virtually—symptomless varieties carried the disease and were instrumental in infecting highly susceptible, but otherwise useful, varieties such as the anti-lodging Q.66. The development of additional resistant varieties seems to be the only solution to this problem.

The localized occurrence of Fiji disease at Alberton in the Beenleigh district, and a small flare-up in the Moreton mill area, were countered by the prompt roguing of diseased stools. Similar minor outbreaks have occurred in other districts in past years, but they have not entailed any modification or abandonment of plans to stamp out this disease. Nevertheless, the standing-over of crops in excess of peak production will complicate the problem by rendering the detection of any diseased stools more difficult, and this could delay attaining the objective of eradicating Fiji disease from commercial cane-producing areas in Queensland.

More detailed information on pests and diseases is given in the following reports by the Senior Entomologist and the Senior Pathologist.

Greyback grub damage in Q.57 at Yule Point, Mossman, May, 1959.

Entomological Investigations

G. Wilson, Senior Entomologist

The Greyback Cane Beetle (*Dermolepida albohirtum*, Waterh.)

Following the usual rains in late November and December, 1958, beetle emergences were sparse, and passed unrecorded in far northern districts; but some grub damage occurred later in the season. In the Ayr and Proserpine districts appreciable damage took place in some fields which are generally not infested and on which no BHC had been applied. The aggregate loss due to greyback grubs, in all districts, 920 tons of cane on 238 affected acres, exceeded the record low figure of 468 tons lost in 1958, but was still considerably less than in any other year. In the old ratoons of some of the earlier, unprotected, plantings at Mossman, grubs caused slight to severe damage over seven acres, destroying 30 tons of cane. In the Mulgrave area yields were reduced by 35 tons on 11 acres in fields on the perimeter of the area where no BHC had been used, although the need for it was fairly obvious. At Tully, the estimated loss of 100 tons on patches aggregating 20 acres, scattered throughout the area, was attributed to occasional weaknesses in the applications of BHC. At Ayr and Invicta, 230 tons of cane were lost on 90 affected acres, most of which was due to unexpected infestations in fields not protected with BHC.

Cane Grubs with a Two-year Life Cycle

Unevenly distributed rainfalls during November and December governed the emergences of frenchi beetles, (*Lepidiota frenchi*, Blkb.) and consobrina beetles (*L. consobrina*, Gir.). Both species emerged in moderately large numbers in the southern part of the Mulgrave area from 21st to 29th November, consobrina beetles being confined to the vicinity of Quingilli, while frenchi beetles were seen as far south as McDonell Creek. Consobrina beetles nated on *Cassia fistula*, *Careya australis*, *Melia azedechar*, and *Psidium guajava*, from 7.0 to 8.0 p.m., while frenchi beetles mated on cane leaves or fences. At Hambledon Mill,

and near Gordonvale, rainfall was one to four weeks later, and frenchi beetle emergence was correspondingly delayed. The loss of cane in the 1959 crop attributed to these species is the lowest on record, totalling only 135 tons on 25 affected acres, as compared with 1,800 tons in the 1958 crop. Most of the reported damage was in the Proserpine and Mackay districts. In the Mulgrave and Hambledon areas peculiar effects were observed, which prevented any losses being determined. Third instar grubs of both species were readily found in November, when symptoms of damage would be expecetd to develop, but cane growth was at a standstill in soil virtually dry to a depth of a foot. In consequence, the grubs did not rise to their normal feeding level until adequate rain fell and moisture became available to the undamaged, shallower, fibrous rooting system. Subsequently, damage in the crop did not reach assessable proportions. There was a heavy flight of beetles of *Pseudoholophylla furfuracea* Burm, at Childers in mid-December, but damage by grubs of the alternating generation was light, and confined to known infested farms. In Bundaberg, damage by grubs of *Lepidiota trichosterna* Lea in the forest areas was similarly light.

Cane Grub Species at Mossman

" Mossman " grubs, indistinguishable morphologically from those of the consobrina species, but differing in having only a one-year life cycle, were bred to the beetle stage and submitted to the Commonwealth Institute of Entomology for identification. However, no specific differences between these and the two-year consobrina beetle have yet been detected and, to avoid confusion when reference is made to the economic and control aspects of the two forms, the common name of " Mossman " beetle, and grub, is being retained temporarily for the one-year cycle pest. At Rocky Point and Bonny Doone Road, where these grubs ravaged crops in 1956 and 1957, populations almost vanished. In the untreated control plots of a BHC trial at Rocky Point, the average numbers of grubs per stool in the three years 1957 to 1959 were, 17.4, 3.5, and 0.6 respectively, and no infestation took place in 1959 in a trial commenced at Bonny Doone Road. Their numbers increased, however, at Whyanbeel and near Mossman township, where they were responsible for a reduction of 70 tons on 20 affected acres. In a field trial at Rocky Point, 2.6 per cent. (refined) gamma BHC dust was applied at 100, 150, 200, 250 and 300 lb. per acre, by three methods viz., (1) broadcast and ploughed in before planting; (2) half at planting time in a band above the lightly covered setts, before full cover was applied, and the remaining half three months later in the half-open drill; (3) the full amount in the half-open drill. The plant crop infestation averaged 4.3 grubs per stool in untreated plots. No significant difference was found between the yields from various rates, or methods, of application of BHC, but the mean yield from all treated plots, 42.2 tons per acre, exceeded that from untreated plots, 38.2 tons per acre, by 4.0 tons per acre, the difference being significant at the five per cent. level.

Of further interest at Mossman was the discovery of two new species of grubs under damaged cane at Yule Point. Adults bred from these were named by the British Museum, *Lepidiota wilsoni*, Britton, and *L. grisea*, Britton. The former has been recorded also, in the beetle stage, from Smithfield, Port Douglas, Bambaroo near Ingham, and the Hann River in the Cape York Peninsula. Wilsoni beetles emerge earlier than is customary for other species of Queensland cane grubs. Adults have emerged in cages in the last week in July, and are commonly seen in the field during August and September. Grisea beetles have not been seen in the field, but in cages they emerged in November. Larvae of *L. wilsoni* had all retreated to the subsoil and commenced to pupate in the first week of May, whereas those of *L. grisea* in the same field were all in the upper soil, and ranged from an early to an advanced stage of development in their third instar. Field observations suggest that both species have a one-year life cycle; in a site heavily infested in two succeeding years, no overlapping generations of larvae were seen in either year. The early emergence of wilsoni beetles results in early damage to cane, characteristically in patches, in which the worst affected young stools may die.

The pest status of grisea grubs is not yet clear; they resemble the greyback grub in size, and congregate under the cane stools, so damage may reasonably be expected, but their late development, light populations and prolonged autumn rains have prevented any damage becoming apparent during the present observations. The optimum use of BHC to control these species requires investigation, as there is evidence that *L. wilsoni* may require heavier applications than are now customary for greyback grub control, and BHC was applied where grisea grubs can still be found. The loss of cane caused by *L. wilsoni*, in patches scattered throughout one farm, was estimated at 70 tons.

New records of cane grubs were not confined to Mossman. Grubs collected from damaged cane at Fairymead plantation, near Bundaberg, in 1958, were identified at the British Museum as *Rhopaea consanguinea*, Blkb., a known species, but with no previous record as a cane pest.

Insecticides for Grub Control

The area treated with BHC for grub control in the 1959 crop, 45,111 acres, showed a slight decrease from the 47,769 acres treated in 1958. In far northern areas, from Mossman to the Herbert River district, there was no appreciable change. At Invicta there was a marked increase from 1,114 to 2,562 acres. A comparison between the areas treated in 1958 and 1959 in the Burdekin district could be misleading, the 10,736 acres treated in 1958 having been inflated by the treatment of a large area of ratoons, after grub damage in 1957 had exposed the inadequacy of previous light applications to the plant crop. However, applications to 4,909 acres in 1959 was a considerable advance on the 2,998 acres treated in 1957. At Proserpine, the area treated increased from 80 acres in 1958 to 350 in 1959. At Mackay, the decrease from 2,600 acres in the previous year to 1,587 in 1959 may have been a reaction to the problem of overproduction.

Counting earth pearls in insecticide screening test; washing soil from cysts over a sieve.

Experiments with Insecticides

At Ayr, lindane sprayed as a suspension in water, replaced the customary BHC dust on several hundred acres treated with BHC, the reason being the substantially lower cost of imported lindane. Although the lindane can be reasonably expected to be as efficacious as BHC dust, the Bureau took the precaution of putting out comparative trials. No results are yet available, and as their relative persistence in the soil during the three-year crop cycle is of importance, that period must elapse before they can be declared to be of similar value.

In the long range investigation of the effect of various amounts of crude and refined BHC on soil fertility, commenced in 1952, a plant crop was harvested in the northern wet zone at Babinda, and a first ratoon crop in the drier southern district of Bundaberg. The results, in conformity with those of previous years, indicate that none of the BHC treatments has, so far, affected normal growth. A third trial site being used in this project in the Burdekin was not harvested during the year. When applications of BHC, heavier than are customary, were considered necessary in field trials against the Mossman grub, the precaution was taken of conducting a phytotoxicity trial with similar amounts on a site free from grub infestation. Two BHC dusts containing 2.6 per cent. gamma isomer were compared, one based on crude BHC containing 13 per cent. gamma BHC, the other on refined BHC containing 70 per cent. gamma BHC. These were applied at the rate of 300 lb. per acre by three methods, viz., (1) broadcast and ploughed in before planting ; (2) divided equally between an application in a band above the lightly covered setts before full cover was applied at planting time, and an application in the half-open drill three months after planting ; (3) the full amount in the half-open drill. These heavy applications were compared with customary local practice, i.e., 90lb. of 20 per cent. crude BHC dust per acre applied in the half-open drill, and also with untreated soil. Planting and early growth took place under rather dry conditions. None of the differences between the mean treatment yields was significant, but it may be relevant that the lowest mean yield obtained, 32.3 tons per acre, resulted where half of the 300 lb. of crude BHC dust had been applied above the setts at planting time. The similar placement of refined BHC dust, at the same rate, gave a mean yield of 35.4 tons per acre, while the customary 90 lb. application, and untreated soil, gave mean yields of 33.5 and 34.9 tons per acre respectively.

Bald coot damage to a stalk of Q.57 at Babinda. Note how the flesh is scooped out of the rind.

In trials against grubs in the Bundaberg district it was observed that, on light sandy forest soils, the ploughing in of 20 per cent. crude BHC dust in amounts in excess of 150 lb. per acre, or shallow discing in of 600 lb. per acre, caused a noticeable and persistent depression of growth;

and amounts in excess of 75 lb. per acre applied at planting time above the lightly covered setts caused a temporary loss of vigour in the plant crop but not in subsequent ratoons. Should heavy applications such as these prove necessary, it can be expected that the use of lindane will avoid these phytotoxic effects. In a phytotoxicity experiment conducted in pots, lindane at a concentration of eight parts per million, caused no detectable depression of root growth from single-bud setts, in a nine week period, but an equal concentration of gamma BHC, in the form of crude BHC, reduced the mean weight of roots per sett from 4.2 g. in untreated soil to 0.5 g. in the treated soil.

The Chrysomelid Beetle (*Rhyparida dimidiata*, Baly.)

Beetles of *R. dimidiata*, whose larvae attack young ratoon shoots on small areas at Bundaberg, were plentiful from January till late in March, sheltering under the bark or between leaves, of their feeding trees, *Eucalyptus tereticornis* and *E. tesselaris*, during daylight. None was seen after the end of April. At night or sometimes on dull rainy days they emerged to mate and feed. They completely defoliated large trees and, when overcrowding occurred, resorted to a secondary feeding tree, *Melaleuca leucodendron* var. *lancifolia*. The only external difference between the sexes noted was the considerably smaller size of the males. Each female contained, on an average, 150 eggs in various stages of development. No eggs could be found in usually infested fields, though larvae were recovered at a later date in grassland. In cages, the yellow, elongate minutely-sculptured eggs, measuring 0.9 x 0.4 mm. were laid in erratically associated groups of 20 to 30 in the soil, at depths from three to five inches. Sometimes they were laid in small numbers or in masses of 60 to 70 on debris on the soil surface. The eggs hatched readily in Petri dishes in 11 to 14 days, increasing appreciably in size, and yielding translucent yellowish larvae 1 mm. in length, which became quick-moving after a short resting period.

In field trials, gamma BHC as crude BHC dust, was applied (1) at rates of 2, 4, and 8 lb. per acre broadcast, half the amount before the final ploughing, and the remainder before a subsequent discing, and (2) at 1, 2, and 4 lb. per acre at planting time, in a band above the lightly covered setts, before full cover was applied. Aldrin was similarly applied at 4 lb. per acre broadcast and 2 lb. per acre at planting time. The mean yields from five replicate plots of these treatments are shown in the table. The infestation in the broadcast section was considerable, and the benefit of the insecticides became apparent at an early stage of growth; but in the drill treatment area the infestation was insufficient to provide significant results. When broadcast, 2 lb.

Battery of mating and ovipositing cages containing trays of soil, used in soldier fly studies.

of gamma BHC per acre caused an increase of 7.6. tons per acre as compared with the yield from untreated plots, that difference being significant at the five per cent. level; increases of 9.3 and 10.5 tons per acre obtained by broadcasting 4 lb. and 8 lb. of gamma BHC per acre respectively, and of 9.2 tons per acre by broadcasting 4 lb. of aldrin per acre, were all significant at the one per cent. level.

TABLE I

Yields of cane obtained by applying gamma BHC and aldrin for the control of *Crhyparida* larvae.

Insecticide	Rate per acre	Yields in tons of cane per acre from the relevant rates and methods of application	
	lb.	Broadcast	Drill
gamma BHC	1	..	46.9
	2	48.2*	48.7
	4	49.9**	47.5
	8	51.1**	..
aldrin	2	..	51.0
	4	49.8**	..
untreated controls		40.6	46.7
*Significantly exceeds control at 5 per cent. level **Significantly exceeds control at 1 per cent. level			No significant differences

The Funnel Ant
***(Aphaenogaster pythia*, Forel)**

Several more infestations of this ant on farms were recorded within its known habitat, from Mossman to Tully, and it was also recorded at Conway, near Proserpine. Two females were taken, fortuitously, at lights near Gordonvale, in September and November, but mass nuptial flights were not seen. Although in recent years significant increases in yields in field trials have frequently, but not always, resulted from the use of soil insecticides, particularly aldrin and BHC, no one insecticide or method of application has been consistently superior, and none of the treatments has markedly diminished the ant infestation. However, in exploratory plots set out in 1958, in which short-range economics were disregarded, aldrin and gamma BHC at 20 lb. per acre, and chlordane at 40 lb. per acre, were broadcast and disced, ploughed, and double disced into a sandy loam, prior to planting. The aldrin and chlordane completely inhibited mound building and eliminated the ants, not only from the treated areas but also in a downhill direction along the rows, from 30 feet of guard space that intervened between the plots. The BHC treatment allowed a considerable survival of ants. Further trials are being conducted to reduce these heavy applications to economic proportions, and other insecticides and methods of application are being tested. In a laboratory screening test heptachlor, aldrin, and korlan were mixed with soil at concentrations of 1, 2, 4, and 8 parts per million, and thirty asexual ants placed in each of three replicate containers. Heptachlor and aldrin were equally effective, causing complete mortality in six days or less in all concentrations, but korlan was less so, and asuntol, neguvon, and malathion had little or no effect; diazinon was highly toxic, causing complete mortality in two days at 1 p.p.m.; lindane caused complete mortality in five days at 1 p.p.m. In laboratory tests diazinon, dissolved in sugar solution and stabilised on bran or sawdust, had proved a readily accepted and highly lethal poison bait, but in the field a single laying of bait killed only a small proportion of the ants. The lack of surface activity by the ants in dry weather, and the perishability of the bait in wet weather, were incompatibles which presented obstacles to the practical application of baiting.

Soldier Fly
***(Metoponia rubriceps*, Macquart.)**

In the field and in cages, adult emergence commenced late in April, reached a peak in May and tapered off during June. Males emerged from pupae 7 to 10 mm. long, females from pupae 11 and 12 mm. long. The normal longevity of males in cages was three to five days, but one specimen survived for seven days. One female caged with a newly emerged male laid 250 eggs by noon on the day of emergence, a further 100 at 3.0 p.m., and died on the third day. The eggs, 1 mm. long, hatched in eight days, yielding white larvae, 1 mm. long, which darkened slowly to brown; four weeks after hatching, larvae underwent their first moult, being then 1.23 mm. long; at six weeks the larvae measured 1.3 mm. long. A curious feature, both in the field and in cages, is the large number of larvae, from 3 to 12 mm. long, remaining in the soil after the normal period of emergence. The fate of these is being kept under observation.

In screening tests of soil insecticides, larvae ranging from 3 to 10 mm. in length, were placed in pots of soil with pieces of cane to which they soon attached themselves. Aldrin, dieldrin, DDT, chlordane, lindane, and malathion were mixed with this soil at concentrations of 2, 8, and 16 p.p.m. During a three-week period mortalities were negligible; at five weeks the following percentage mortalities had taken place in the 2, 8, and 16 p.p.m. concentrations respectively; aldrin, 12, 48, 56; dieldrin, 4, 12, 44; lindane, 0, 32, 68. Death took place more readily amongst the smaller larvae. After 12 weeks, 100 per cent. mortality had occurred only in aldrin and lindane at 16 p.p.m., that in dieldrin at 16 p.p.m. being 83 per cent. The results with the other insecticides were markedly inferior. Experiments were conducted to detect the effect of larvae, in numbers up to 20, on the germination and growth of single-bud setts in potts, but poor germination in uninfested controls rendered the results inconclusive. When similar numbers of larvae were introduced into pots after the setts had germinated, no differences in growth could be detected by visual observation during a period of several months.

Earth Pearls
(Margarodidae)

Exploratory screening tests of soil insecticides in 1956 against the encysted stage did not give encouraging results. In 1957, five females were allowed to oviposit in each pot of untreated and treated soil so that the thinly-integumented, mobile, young larvae would encounter any insecticide present. Cane roots were provided by setts planted in the pots two months before the females were introduced. The insecticides used, and their concentrations, are shown in the table, in which is set out the total number of cysts of *Eumargarodes laingi*, Jakubski, that developed in the five replicates of each treatment.

TABLE II

Total numbers of earth pearls of *E. laingi* surviving various treatments.

Treatment	Total Cysts in each concentration					
	32 p.p.m.	16 p.p.m.	8 p.p.m.	4 p.p.m.	2 p.p.m.	1 p.p.m.
Parathion	0	0	0	0	0	0
Dieldrin	0	1	0	2	3	0
Aldrin	0	2	80	214	22	124
Endrin	1	1	69	127	128	43
BHC	2	21	92	76	78	21
DDT	7	0	74	61	44	50
Chlordane	16	236	125	78	129	151
Control	193					

Parathion was highly effective, preventing earth pearl development at all the concentrations used, and dieldrin gave a high degree of control, at all concentrations. As parathion is not reputed for persistence in the soil, dieldrin might prove more effective over the three-year crop cycle.

Miscellaneous Insect Pests

Two species of black beetle attacked young cane. In southern districts, adults of *Heteronychus sanctae-helenae*, Blanch. attacked the shoots of young plant cane, and ratoons, particularly the latter, between October and January; some relief was obtained by spraying a dispersible powder containing one-quarter lb. of lindane per acre and incorporating it in the surface soil in plant cane; in ratoons the lindane, applied immediately after harvest, was lightly cultivated into the soil, and cane tops were burned off. At South Johnstone, under extremely dry conditions, larvae of *Metanastes vulgivagus* Olliff. attacked the bases of primary shoots in plant cane in December, on heavy alluvial soil. Apart from the cost of replacing the most affected plants, there was no appreciable loss. In the Burdekin, the giant termite, *Mastotermes darwiniensis*, Froggatt did minor damage, reducing yields by 25 tons on 10 acres. The termite *Coptotermes acinaciformis*, Froggatt, was more active than usual in the Bundaberg area, probably because of the lack of moisture in its native habitat, invading cane from mounds in adjacent open forest; the damage ceased when they were fumigated with carbon bisulphide. The beetle borer, *Rhabdoscelus obscurus*, Boisd., which intensified its attacks in the Goondi area in 1957, subsided to a low level of infestation, but was present over a large proportion of that area; elsewhere, its incidence was negligible. Wireworms, principally *Lacon variabilis* Cand., which can be readily controlled by the use of BHC at planting time, gave trouble where that precaution was ignored or inadequately applied. At Plane Creek, 27 acres of young cane was damaged, and 36 acres more had to be ploughed out. Minor damage occurred at Mackay, Mossman and Babinda. In field experiments at Mackay, in which lindane and aldrin were compared with crude BHC dust for wireworm control, it was demonstrated that, at least under the very dry conditions then prevailing, the phytotoxic effects of insecticide-fertilizer mixtures placed very close to the setts, as measured by the rate at which primary shoots appeared above the soil, could be attributed to the fertilizer rather than to the insecticide. The scale insect, *Aulacaspis madiunensis*, Zehnt., was noted in a standover plant crop of Q.58 at Racecourse, Mackay, where its presence has been previously recorded, but this scale is a more serious threat in the Isis district, particularly in standover crops of the variety C.P.29-116. A soft scale found on leaves of sugar canes growing in the quarantine plot at Magnetic Island, which were introduced from New Guinea in 1957, has been identified by the Commonwealth Institute of Entomology as *Pulvinaria iceryi* Signoret. The canes were sprayed with parathion and were treated with a systemic insecticide during their period of growth, and as a further precautionary measure they were hot water treated before being removed from Magnetic Island to the Queensland mainland. The possible occurrence of this insect on alternative grass hosts on the Island is being investigated.

Animal and Bird Pests

Dry spring weather in 1957, and again in 1958 considerably reduced rat activity in the 1958 crop, in which the estimated loss due to rodents amounted to 21,500 tons as compared with 65,000 to 70,000 in 1957. Little activity could be detected in the early months of 1959 but, by June, when rat bites were appearing in the cane, reports varied even between adjoining mill areas; many considered that rat activity was still negligible, but some saw indications of increased damage in the 1959 crop.

Lack of rain caused wallabies to turn to cane for green feed, particularly in the Burdekin mill areas. At Invicta, although 700 were destroyed, their persistent feeding on seven acres of ratoons resulted in the field being ploughed out as worthless; and at Ayr losses were estimated at 500 tons on 250 affected acres. Neither persistent shooting nor the noise of a carbide gun, set to detonate at seven-minute intervals, succeeded in keeping the animals out of cane fields ; they

avoided fields where the carcases of those shot were left to decay, but scattering freshly manufactured meat-works fertilizer on the cane leaves had limited deterrent effect. The animals were highly selective in the cane varieties attacked, rejecting Trojan, Pindar, Q.58 and Q.63 in favour of Q.50; and Pindar and Q.59 in favour of Co.475 and Q.44. Wild pigs destroyed approximately 1,000 tons of cane in northern areas at Mossman, Hambledon and Mulgrave and did slight damage in the Burdekin district. The most effective control was fencing, which was put to good effect at Babinda, and in parts of Mossman, while shooting undoubtedly limited the amount of damage done in the Mulgrave area. The striped phalanger, *Dactylopsila picata*, Thomas, commenced feeding on cane stalks in April in far northern districts from Mossman to Tully and similar damage was reported in Mackay. On many farms the damage was negligible, but on some there was considerable loss on small areas.

Two bird pests caused appreciable damage. Dry weather caused bald coots to be more troublesome than usual at Mackay and Proserpine; at Ayr, by destruction of young shoots and mature cane, they caused losses estimated at 450 tons on 150 acres. The detonations of a carbide gun gave the birds only temporary alarm and they soon resumed feeding a short distance away. On one farm at Babinda they channelled out the mature stalks causing damage estimated at 150 tons. White cockatoos continued to be a pest on the perimeter of the Proserpine area, destroying about 400 tons of cane. They showed a strong varietal preference for Q.50 and Q.58 and it is likely that the planting of the less acceptable varieties, N.Co.310, Q.28, C.P.29/116, Pindar, Q.57 or Q.63 in the outer rows may prove beneficial on farms where their attacks are usually concentrated. The carbide gun, detonated at ten-minute intervals, frightened the birds within a useful radius.

A chlorotic streak disease drum experiment is set out in a wet area in North Queensland.

Disease Investigations

C. G. Hughes, Senior Pathologist

Leaf Scald

***Xanthomonas albilineans* (Ashby) Dowson**

The leaf-scald resistance trial at the Pathology Farm was inoculated in the usual fashion by dropping inoculum of a diluted extract from diseased stalks onto the freshly cut stubble surfaces, but, following a successful skirmish trial last year, the trial was burnt before harvest. The inoculations were made during the first week in September and by the end of October disease had developed well in the susceptible varieties.

The resistance of the seedlings N.654 and N.685, both of which feature H.35–198 in their parentage, is of interest in view of the present difficulty in obtaining scald-resistant canes for North Queensland. N.685 (H.35–198 x H.39–3633) is the more promising of the two.

Final figures at the beginning of the wet season in January are set out in the table :—

Percentage Stool Infection	Varieties
0	Co.281, N.654, N.685.
1–20	H.35–198, H.40–1184, N.649, Q.50.
21–60	———
> 60	H.Q.426, L.688, Mahona, Oramboo, Q.44, Q.64, Q.66, Trojan.

The exploratory trial with 13 standard varieties, planted in 1957 on tableland country at the back of Cairns, was inoculated at ratooning in the spring of 1958. Varieties showed up to 94 per cent. infection and it would appear that trials at that location will develop a satisfactory amount of disease. An interesting observation was of leaf streaks in shoots of Pindar cut and

inoculated just above the growing point. Symptoms of any kind are rare in this resistant variety in commercial fields, and only the localized streaks appeared in the trial.

The promise shown by a number of the newer canes, such as Q.64 and Q.66, in North Queensland, and their proved susceptibility to leaf scald in this region where the disease is endemic, has forced a revision of the standard of susceptibility which can be allowed. There is no doubt that both varieties are valuable additions to the northern approved variety list; there is also no doubt about their susceptibility to leaf scald, and a calculated risk has had to be taken with their commercial propagation. The same had to be done for Q.44 some years ago and, in that instance, the extra profit from the variety has warranted the risk of losses and the actual losses which have occurred in many individual plantings. Q.64 is of much the same order of susceptibility as Q.44 and, while losses in it will occur, the indications are that the insistence on clean planting material will enable the variety to be grown over many years. The variety Q.66, which is the most susceptible variety ever tested in Queensland, may not survive as an economic proposition, despite all precautions. In the meantime, however, this very valuable special-purpose cane for the rich alluvials of North Queensland can continue to give a crop with satisfactory sugar when other varieties are a total loss from lodging or flooding.

The growing of susceptible varieties cannot be countenanced when there is a possibility of eradication of a disease but, on our present knowledge, the eradication of leaf scald is a distant goal, even though attempts to keep losses at a minimum may be quite successful.

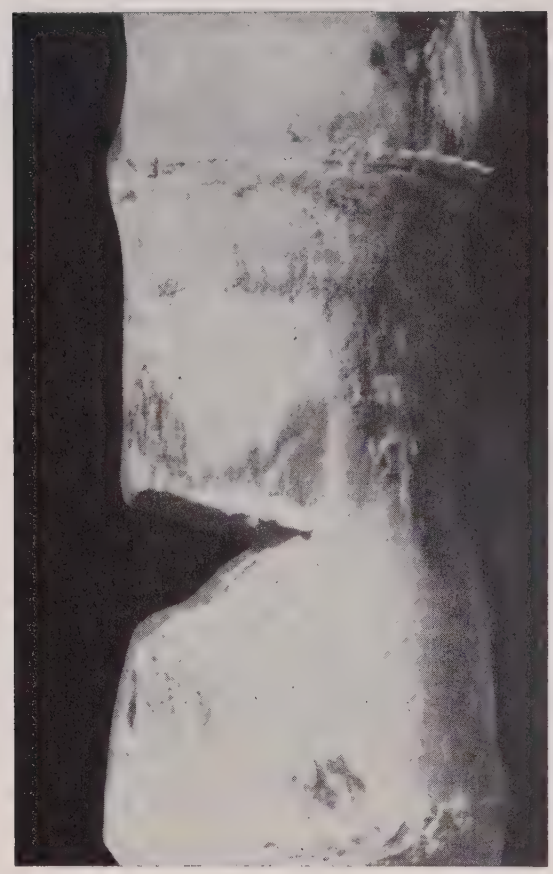
Ratoon Stunting Disease

The results of the resistance trial at the Pathology Farm indicated again that the variety Q.28 is as susceptible to ratoon stunting disease as any cane is likely to be, although several seedlings were also in this category; Co.290, P.O.J.2364, Q.67 and Trojan showed some losses.

The hot-water treatment of cane for plants continues as a routine practice in the industry. The scheme is that a comparatively small amount is treated each year, and this then provides a nucleus for further plantings. In some instances the clean seed is distributed direct to farmers, who then multiply it for their own use; in others, the local Cane Pest and Disease Control Boards establish plots, from which many farmers can draw their supplies. Much of the cane is treated in the sett but there is an increasing amount being treated in the stalk. There does not appear to be any reason why this should not be quite as effective in controlling the disease, providing the circulation around the diseased stalks is satisfactory. From the mechanical aspect of the handling of the cane, the full-stalk treatment has much to commend it, in that less labour is involved and the farmers are able to use their cutter planters. Experiments have shown that germinations are equal to the sett-treated material.

Analysis of the figures of treated cane, and progeny from treated cane used for plants, shows that in several of the mill areas virtually 100 per cent. of the plants now comes from these sources, and the figure is very high for many other areas. Nevertheless it is planned to continue treatment indefinitely to make certain that the amount of disease never increases again to damaging proportions.

Mr. D. R. L. Steindl (left) shows ratoon stunting disease to South African visitors Dr. G. Cleasby, Mr. J. L. du Toit and Mr. C. H. O. Pearson at the Pathology Farm.



Pokkah boeng disease may produce a "knife cut" in the mature internode.

Fiji Disease

A few stools of cane affected with Fiji disease were again rogued in the Rocky Point area to the south of Brisbane, but there is no reason to believe that the amount of disease is not being reduced and the goal of eradication is well in sight.

At times this ultimate achievement can be somewhat elusive as was illustrated by a finding of Fiji disease on a farm in the Moreton area during February, 1959. Seven stools were found by the Moreton Cane Pest and Disease Control Board in a 2.5 acre section of a 13 acre field of plant N.Co.310, growing on a hillside above Paynter's Creek. The cane had been planted with a cutter planter and the diseased stools occurred in two groups, indicating that two diseased stalks were responsible. Several inspections of all cane fields and other lands in the vicinity have failed to reveal any further disease, but the fact that the finding was not made until large populations of the insect vector (*Perkinsiella saccharicida* Kirk.) had built up indicates that some secondary spread might have occurred.

The source of the plants for the diseased block did not reveal a single diseased stool on several careful inspections and it is obvious that the carryover of the disease from the last outbreak was in very small amounts. How this actually occurred is not clear, for the last disease found on this farm was in May, 1952—the last in the Moreton area as a whole was in January, 1955—and if the disease had persisted in a relatively susceptible variety such as N.Co.310 over that period, it is certain that much more disease would have developed. Appropriate action to prevent any spread of the disease has been taken.

Both plant and ratoon Fiji resistance trials at the Pathology Farm have been stoodover and results will not be available until towards the end of the year.

Chlorotic Streak

Work on chlorotic streak disease during the year under review included both field trials and pot and drum experiments.

A yield trial at North Eton, Mackay, incorporating the varieties C.P.29/116, Q.50, Q.58 and Pindar, was harvested as plant cane in spring 1958 with the results shown in the table. All setts used in the diseased plots came from stalks showing symptoms, and it was noted that the diseased plots showed many more symptoms than the healthy throughout the growth of the crop. The differences in tonnage between the healthy and diseased series are significant at the one per cent. level for Q.50 and Pindar, and at the ten per cent. for Q.58, but are not significant for the C.P.29/116. Sugar analysis figures showed no significant differences.

At Bundaberg, the application of Nemagon soil fumigant to young ratoons of Pindar showing

——	C.P.29/116	Q.50	Q.58	Pindar
	t.p.a.	t.p.a.	t.p.a.	t.p.a.
Healthy	41.3	38.2	37.8	35.0
Diseased	34.6	30.4	26.7	22.4
Difference	not significant	highly significant	significant	highly significant

chlorotic streak had no effect on the subsequent expression of the symptoms. A trial involving fumigation with DD and EDB before planting in a portion of a field which has shown disease in the past, developed very little disease in the plant crop and will be kept under observation in the ratoons.

Several trials in North Queensland designed to find whether hot-water treatment of setts had any effect on subsequent development of the disease have given inconclusive results. At Meringa, young, potted, original seedlings of the crosses Trojan x Q.28 and Trojan x Q.58, which parents are all susceptible to chlorotic streak, were inoculated by rubbing the leaves with a fresh extract from diseased leaves mixed with kieselguhr. Infection did not occur although the waterlogging which occurred during the wet season would have been expected to favour the expression of symptoms.

In the pot and glasshouse work, transmission of the disease was obtained in gravel culture at Meringa and in gravel culture and solution in Brisbane, when diseased and healthy plants were grown together in the same containers. In addition, transmission occurred in a solution experiment of a different type. In this, healthy shoots were grown in one tin of a pair of tins and diseased in the other, and changes of plants from tin to tin made three times a week. The diseased and healthy shoots were not at any time together in the one tin. Symptoms developed in the healthy plants after a period of three to six months.

The results of these experiments are largely confirmation of transmissions already obtained in bench work overseas; the problem of producing abundant symptoms at will, even in diseased shoots, remains to be solved.

A detailed examination of more than 750 streaks, occurring on plants of Q.67 in drums of soil at Meringa over a period of seven months, showed that there was a tendency for streaks to occur on groups of leaves rather than single leaves, which may only indicate the operation of some over-riding climatic influence. The examination also showed that streaks may increase considerably in length over a period of time, may occasionally disappear from leaves, and may first appear on a leaf when it is mature, i.e., some time after its emergence from the spindle.

An extensive series of further trials of various types is under way.

Mr. R. Robinson, Supervisor of the Proserpine Cane Pest and Disease Control Board, looks at bacterial mottle occurring naturally in guinea grass.

Canes in a chlorotic streak water culture experiment make fair growth.

Bacterial Mottle

This bacterial disease, which is apparently confined to Queensland, has appeared in a number of new localities during the year under review. It showed in a few stools of cane for the first time in the Mulgrave, Babinda, Innisfail and Lower Burdekin areas, in each instance in fields which had been flooded. It was also found in guinea grass (*Panicum maximum* Jacq.) at Home Hill on the Lower Burdekin. Although the disease has appeared in new areas practically each year since its recognition in 1955, it does not give cause for alarm. Except in rare instances, only a few stools are involved, and it would appear that the general standard of resistance of present commercial varieties is sufficiently high to prevent any serious losses.

The causal bacterium can apparently exist for some time in a stool without showing any external evidence. This is in line with the known behaviour of the organism causing leaf scald. It was shown quite dramatically in a plot of sett-inoculated Trojan at the Pathology Farm, when bacterial mottle did not appear until the first ratoons. The elapsed period from sett inoculation to first development of symptoms was approximately 20 months.

Yellow Spot
***(Cercospora koepkei* (Kruger)**

Dusting experiments with copper oxychloride against yellow spot were initiated in North Queensland after the first period of prolonged wet weather in the middle of January, and continued for a period of three months. The aim was to prevent the early build-up of the disease and, as it happened, followed an unusually long, dry, hot period when the disease had been reduced to vanishing point. Early development of the disease was less than normal but, even so, there was sufficient to indicate that regular dusting at weekly intervals (obviously an impossible proposition on farms during the wet season) gave a measure of control under the prevailing conditions, but that dusting only after periods of several days of damp weather was not effective. Subsequent to the conclusion of the experiments in April, the continued late wet season led to a further development of the disease in all plots. Sugar figures in mid-winter showed a loss of up to three units in the untreated plots, and the treated plots still had a better top to the extent of between one and two more live green leaves.

Yellow spot was particularly severe in Trojan in the Innisfail district where the combination of disease and free-arrowing led to a complete loss of cover. Harvest burns were thus made difficult, and the usual winter growth increment lost.

The Bureau's quarantine house is conveniently situated on the roof of the new head-office building.

Mosaic

The campaign against mosaic disease in the Habana area at Mackay has been continued by the local Cane Pest and Disease Control Board and a successful control of planting material established. The finding during this work of a strain of mosaic possibly different from that normally occurring in Queensland prompted an intensive roguing campaign in large cane on the affected and neighbouring farms. This was designed to reduce infective material to a minimum, pending further roguings and observations in the young cane in the spring, when symptoms would be more obvious and inspections much easier. Leaf symptoms in the grown crop of Q.50 were very difficult to pick up, and it is of interest that the roguing was done on the basis of symptoms on the upper portions of the stalk. These were exposed by flailing along the rows with a stalk of cane.

The plant mosaic resistance trial at the Pathology Farm did not develop sufficient disease

Severe eye spot infection gives a ragged appearance to the crop; the variety is Q.70.

A chlorotic streak yield trial at Mackay shows a marked difference between a diseased and healthy plot.

to warrant any definite conclusions, and will be inoculated again by the Sein method in the young ratoons. There was a generally satisfactory increase in disease in the ratoon trial, although the small amount of disease in Q.50 still indicates that some varieties showing little infection may not be resistant in the field.

Downy Mildew
***(Sclerospora sacchari*, Miy.)**

There have been no further findings of downy mildew in the Bundaberg area since the single stool rogued during the 1957-58 season. Inspections were continued over the 1958-59 growing period and it is to be hoped that this small outbreak, the last for some years in Queensland, has now been stamped out.

Inspection of the ratoon downy mildew resistance trial at the Pathology Farm in June, 1959, showed a considerable increase in disease in comparison with the plant crop, and the resistance of such seedling canes as N.45, N.202, N.260 and N.263, was even more clearly shown. However, it does not appear necessary at this juncture to ratoon the downy mildew trial as a regular practice.

Minor Diseases

The Pathology Farm is well known as a repository of minor diseases collected over the years from the cane fields of Queensland. They form a section which is always of interest to cane growers and specialist scientists alike. Some are undoubtedly genetical in origin, while others are certainly caused by virus or fungal agencies. They offer a range of symptoms and causes, and their reaction to the heat treatment used against ratoon stunting disease could be of general interest. Setts from a total of 21 of these diseases were subjected to hot-air treatment at 54°C. for 16 hours but the subsequent plantings did not indicate any curative effect. It is obvious that heat treatment of setts does not have a wide application in cane disease therapy.

Stalks in a red rot trial are inoculated with a suspension of spores injected into a drilled hole.

Top rot may cause severe losses in the variety Q.67.

Mercurial treatment of setts is essential for a good strike. The sprays in the cutter planter became blocked as the machine entered this row.

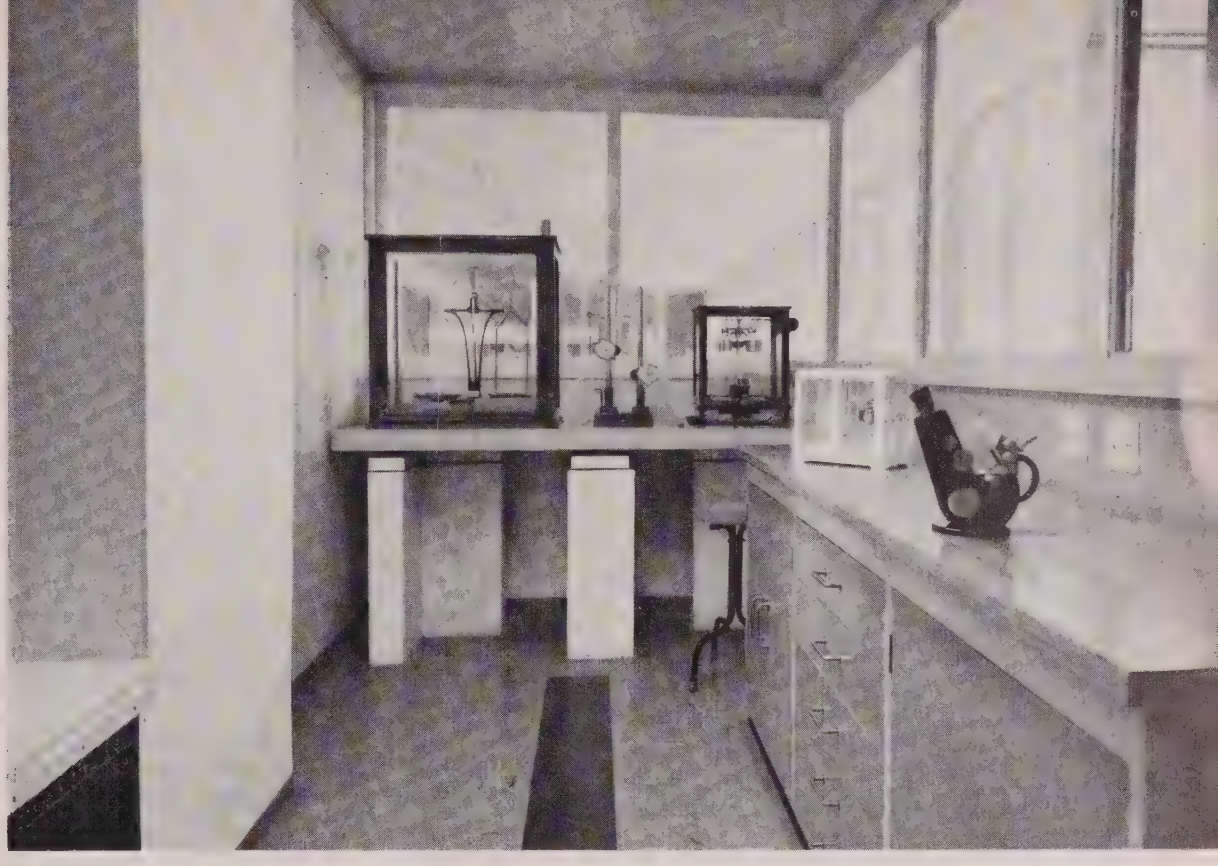
New Guinea Introductions

The New Guinea canes from the Magnetic Island quarantine planting were distributed during August, 1958, some thirteen months after the last batch had been planted. Two setts each of 48 varieties were forwarded to the United States Department of Agriculture, and four setts each of 56 to the Colonial Sugar Refining Co.'s isolation planting near Macknade. Distribution within the Bureau consisted of 155 nobles to Bundaberg Experiment Station and 217 varieties of all types to Meringa. All setts were treated at the Magnetic Island plot in hot water at 52°C. for 20 minutes before packing. At the same time one stalk of each variety was examined for ratoon stunting disease. Results were negative, which is in accord with the findings in the 1951 New Guinea introductions and indicates that the disease is at least not widespread in that part of the world. This is of particular interest in that New Guinea and its environs are regarded as the cradle of the sugar-cane species *Saccharum officinarum*, and the inference is that the disease did not develop coincidentally with the species.

Plantings at Meringa and Bundaberg were sprayed regularly to prevent insect colonization, and kept under close surveillance. Some apparently genetical frecklings, which had been noted in the original plant crop, were observed, and one variety showed mosaic disease at Meringa and was destroyed.

Legumes

Cultures were supplied, as in previous years, free of charge to cane farmers for the inoculation of green manure crops. In response to a query as to the possible effects on nodulation of the tetra methyl thiuram disulphide (TMTD) dust used as a fungicide on imported seeds of velvet beans after cleaning, a pot test was set up in the glasshouse in Brisbane. The seeds used were from samples from commercial lines and the results showed that the TMTD had no deleterious effect on nodulation by the rhizobium.



A section of the constant temperature room in the Bureau's new building. At the end is the anti-vibration bench for balances and for the dual comparator.

Division of Mill Technology

J. H. Nicklin, Chief Technologist (Engineer)
and
L. R. Brain, Senior Mill Technologist

Laboratory Work

The excellent arrangement of the constant temperature room of the new building has facilitated the work of standardisation of equipment for the mills. The growing awareness of the importance of checking equipment has resulted in the volume of work extending markedly, and this service is brought to the notice of mill personnel on every available occasion. It is a standing arrangement with a number of mills that apparatus must have the certification of the Bureau before it is accepted from the supply houses.

During the year the equipment tested and certified was as follows:—

Type of Apparatus	Number Tested	Number Certified
Balances	1	1
Brix Hydrometers	461	442
Burettes	3	3
Flasks A Class	12	11
Flasks B Class	219	161
Pipettes	66	66
Saccharimeter Tubes	91	83
Saccharimeters	9	9
Quartz Control Plates	1	1
Refractometers	10	9
Thermometers	102	83
Sets of Weights	5	4

From this table it can be seen that a significant proportion of the equipment checked did not satisfy the necessary requirements.

Further, under the terms of certification of the National Association of Testing Authorities, portion of the certified equipment received N.A.T.A. certificates, viz., 1 balance, 307 brix hydrometers, 2 burettes, 5 flasks (A Class), 3 flasks (B Class) and 2 sets of weights.

As portion of the co-operative project on the use of bagomolasses as stockfeed, 7 samples of molasses and 10 samples of bagomollasses were analysed.

Investigations of Analysis of Cane

The project concerned with the analysis of cane as a basis for cane payment continued during the 1958 season, directed by the committee appointed by the Sugar Experiment Stations Board and the Central Sugar Cane Prices Board. However, early in 1959, the Minister for Agriculture and Stock appointed a new committee, comprising the members of the old committee and Mr. C. W. Davis of the Colonial Sugar Refining Co., to continue the investigations. This committee is now responsible to and will report solely to, the Minister.

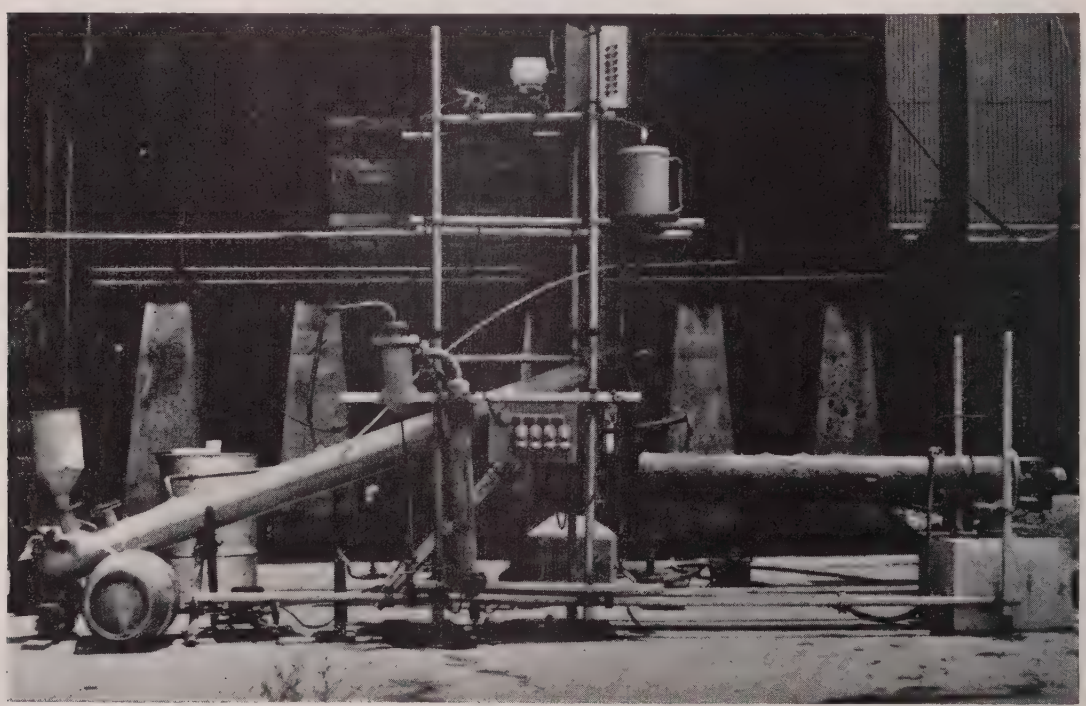
The majority of the staff of the Division of Mill Technology is involved in these investigations.

Use of Soda Ash in Clarification

The use of soda ash in clarification has been noted in some overseas countries and a small trial in 1956 to evaluate its usefulness proved to be inconclusive. A more extensive trial was conducted in 1958, after laboratory tests had indicated that, (a) soda ash did not adversely affect clarification by visual standards, (b) the method of addition was not critical and (c) soda ash reduced the calcium content of the clarified juice. If, however, the lime and soda ash were mixed prior to their addition to the juice, the consumption of soda ash increased for specified conditions.

The factory trial at Qunaba was conducted over six weeks, soda ash being added on alternate weeks, normal liming being practised during the intervening weeks.

Observation of the factory operation indicated that the soda ash, used in the quantities of 22 to 54 per cent. on lime, had no effect on clarification



The continuous pilot wax-extraction plant which was operated by C.S.I.R.O. at Millaquin Mill.

or boiling. The composition and quantity of the scales in the effets were not affected significantly although it was claimed that the scales were, perhaps, easier to remove. No change was observed in the analysis of sugar and final molasses.

It is concluded that, under the normal conditions of operation at Qunaba, the use of soda ash is not warranted.

Stability of Juice at Varying pH

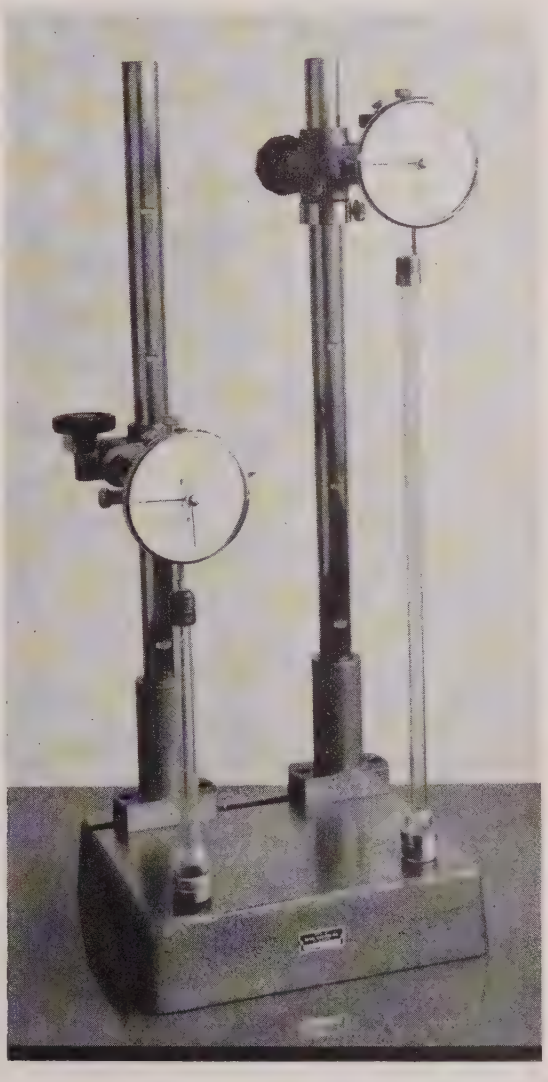
As a basis on which to judge the effect of pH on the sucrose and reducing sugar contents of juices during clarification, the chloride content of the juice was adopted. A series of laboratory investigations indicated that, while the reducing sugar content was stable at a pH between 6.4 and 6.8 depending on the nature of the juice, the sucrose content showed no definite trend. Some factory work showed similar results.

An extensive investigation of the method of chloride estimation was then undertaken and is still in progress. Complete confidence must be established in the method before further work is undertaken.

Hardboard from Bagasse

Paper or hardboard is being made from bagasse in most cane sugar producing countries. The production of paper involves heavy capital expenditure, water requirements are high, and there may also be problems in connection with effluent disposal. These difficulties do not exist in the case of hardboard manufacture, especially if a dry process is used. Paper manufacture might be regarded as a district scheme, but there seems to be no reason why hardboard production could not be undertaken quite successfully by any large sugar mill, especially if there is a considerable surplus of bagasse. With these facts in mind the co-operative effort with Monsanto Chemicals (Aust.) Pty. Ltd. in the production of trial boards, using urea formaldehyde as a bonding agent, was continued. The boards produced have a thickness of about 3/16 inch and both sides are smooth. Representative samples were tested by the University of Queensland.

It was found that for optimum results the initial bagasse should contain 10 per cent. moisture and that the resin should be used in the proportion of 6 per cent. of the board. The bagasse was previously hammer milled through a 3/16 in. screen and retained on a 1/25 in. screen. The boards compared favourably with locally made fibreboards. A further series of boards made from bagasse passed through a 1/16 in. screen and retained on a 1/25 in. screen exhibited an



A dual comparator used by the Bureau for checking the length of saccharimeter tubes.

improved surface finish and showed no reduction in strength.

The project is now being continued with the production of low density boards (s.g. 0.5—0.7) suitable for use as corestock.

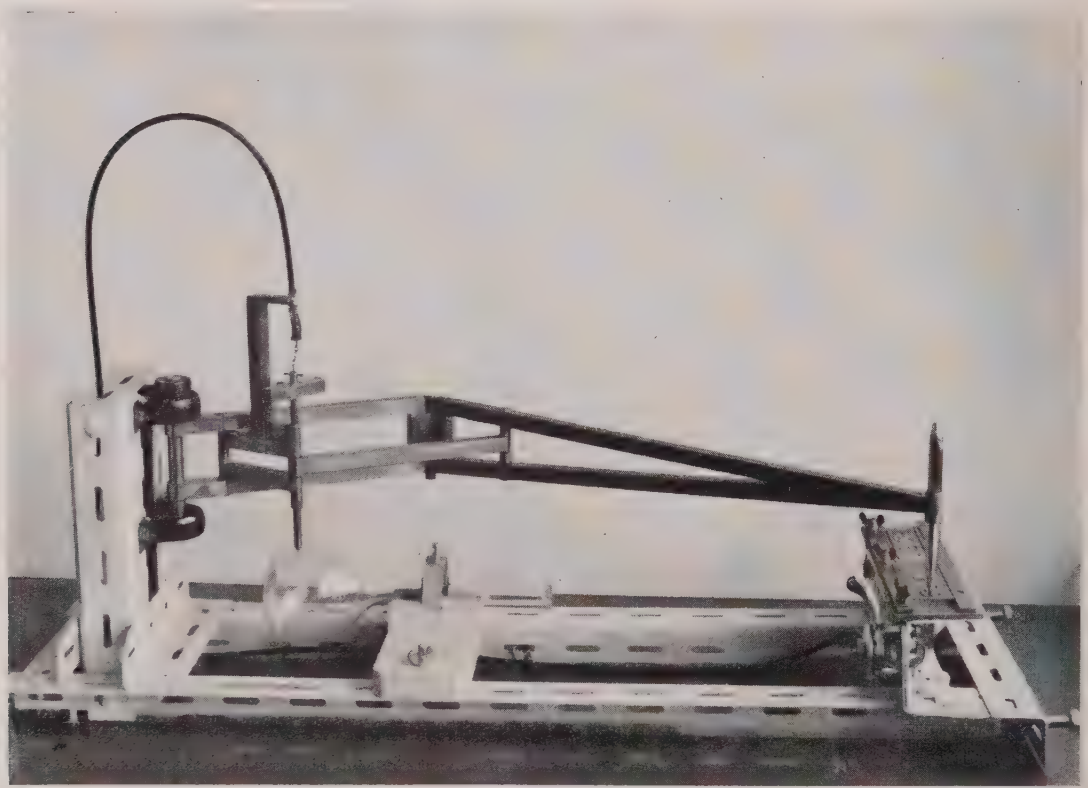
For commercial board production, a plant capable of producing both high density and low density boards is considered desirable so that production can be varied with the market requirements.

Cane Wax

Although the Bureau was not successful with a pilot plant for the continuous extraction of wax from dried filter mud, good results were obtained with batch extraction of wet mud. It was felt, however, that a continuous extractor would be preferable for full scale operation.

The C.S.I.R.O. reported favourable results with a very simple type of continuous extractor which they had set up in Melbourne for use in connection with their wax research work; and their offer to erect the plant at a Queensland mill, and test it on material direct from the filters, was gratefully accepted. With the co-operation of the Millaquin Sugar Company the plant was erected at Millaquin Mill and operated for a short time by an officer of the C.S.I.R.O. The best extraction obtained was much less than had been obtained in Melbourne and it would appear that there is a considerable difference in the behaviour of fresh mill mud and the reconditioned dried material which had been used in the Melbourne tests.

The Bureau is grateful to the C.S.I.R.O. for the work they have done and for the fact that, in an endeavour to overcome the difficulties encountered, it is to be continued. Acknowledgement must also be made of the very real assistance given by the Millaquin Sugar Company.



The glass marking machine for engraving apparatus checked by the Bureau.

Effet Tests

With a view to arriving at a suitable design figure for the evaporation to be expected from a set of effets, tests were carried out at Millaquin, Pleystowe and Qunaba.

Effet performance falls off from the start to the finish of a week's crushing operations. Cleaning at the week-end restores the efficiency. The tests suggested that an " end of the week " evaporation figure of 0.058 lb. per sq. ft. per °F. true temperature difference could be used to assess the capacity of a quintuple evaporator set as normally operated in Queensland.

Control of Boiler Feedwater

Work was continued with the conductivity instrument.

A small timer was arranged so that the conductivity cells in six different condensates could be connected in turn to the controller for about six seconds in every minute. With the controller set at some reasonably safe value for conductance, which value had been decided on previously, the relay of the instrument operated when the conductance of any condensate exceeded the set value. Operation of the relay sounded an alarm and at the same time caused the shutter of an indicator, corresponding to the particular cell in circuit at the moment, to drop.

The continuous making and breaking of the cell circuits did not seem to affect the sensitivity of the instrument and it was found possible to differentiate between condensates having a difference in conductance of two micromhos.

A conductivity controller could be particularly useful where juice heater condensates are used for feedwater. Warning of a burst tube or sudden leak would be given immediately, and it would not be difficult to carry the protection a step further and arrange for automatic diversion of the faulty condensate.

General

The system of mill visits was continued, each being visited at least once by an officer of the division. Specific problems were investigated at Gin Gin, Babinda, Invicta, Pioneer and Moreton. It is of interest to record that, with the installation of a generating set at Gin Gin, the auxiliary electric power of all twenty-seven Queensland mills with which the Bureau maintains contact will be supplied during the crushing season from their own generating sets.

THE 1958 SEASON

Although a considerable amount of cane was left in the field after the 1958 season, the production of 94 n.t. sugar was a record at 1,353,543 tons. The actual cane harvested did not exceed that harvested in the record year of 1954 but the c.c.s. of the cane was 0.58 units higher than in that year, the tons of cane required for a ton of sugar being 7.20. This result is rather remarkable as lack of rain early in the year occasioned concern especially in the southern district where it did not appear that the mills would reach their respective peaks. However, subsequent conditions produced both improved tonnage and c.c.s. resulting finally in a measure of over-production. Actually up to 15.5 per cent. over peak production was accepted from individual mills.

The quality of cane was low early in the season but it improved as the season progressed and the final c.c.s. of 14.08 was 0.16 below that of the previous season. Although factory performance showed an improvement, the overall result was an increase in the tons of cane per ton of sugar to 7.20. A slight increase in c.c.s. was recorded in the northern area while all other areas recorded a decrease. Once again, the fibre per cent. cane continued to fall from 13.26 to 13.05 per cent. This drop in fibre content was found to some extent in all areas, although that in the northern area was very slight. The weather conditions, which favoured effective burns, and more attention to the control of cane cleanliness, were each responsible for portion of the improvement.

While this trend in fibre content is very satisfactory, it cannot be expected to continue, as the number of mechanical harvesters is slowly increasing, and it might be expected that the extraneous matter in mechanically harvested cane

will be greater than that obtained by hand cutting under reasonable control.

Ideas on the limit of the crushing rate of Queensland mills need constant revision as the rate increases each year. In 1958, the average was 113.99 tons per hour, an increase of 4.5 tons per hour over that of the 1957 season. While it is true that extra equipment has helped to some extent, trains with little alteration in the actual milling equipment have shown significant increases in crushing rates. Also, a slight increase in pol extraction from 94.51 to 94.57 resulted, one factor in this increase being the decrease in the fibre content of the cane. The Burdekin district, and particularly the southern district, showed a rise in extraction while the northern district recorded a fall.

Truck handling at the carrier has been facilitated in some mills by the installation of truck " spotters " and automatic greasing equipment, which have removed one obstacle to high crushing rate, particularly when trucks are lightly loaded.

The overall factory performance has shown a significant rise, the coefficient of work being 98.20 compared with 97.49 in 1957. As the extraction has increased only to a small extent the processing department of the factories is relatively much improved, the recovery on mixed juice increasing from 91.26 to 91.67. While the southern district has recorded the outstanding increase in coefficient of work from 95.33 to 97.55, the Burdekin and Mackay areas also showed an increase; the northern district alone recorded a decrease.

The treatment of low grade massecuite has also improved, as indicated by a significant decrease in the purity of final molasses — 42.83 compared with 43.72 in 1957. Actually, the expected purity has decreased with the increase in the reducing sugar - ash ratio in all districts, and an accompanying decrease in molasses purity was recorded in each district. The difference between the actual purity and the expected purity fell from 2.9 in 1957 to 2.5 in 1958, which is commendable.

Sugar quality was maintained at the standard set during 1957. More mills are now being equipped with batteries of automatic fugals, which facilitate the production of a regular grade of sugar at an even rate. This latter factor is helpful to the operation of sugar driers in maintaining a consistent dilution indicator below the allowable limit.

The dry crushing season is reflected in the very low usage of extraneous fuel in all areas, due mainly to the regularity of cane supply.

The system of cane payment based on juice scales was operated for the 1958 season at three mills but, subsequent to the conclusion of the season, new regulations were gazetted which did not include this as an alternative method. However, the pleasing trend in the number of juice scale installations has continued and there are now nine factories equipped with these machines, with two more to be equipped during the 1959 season. As more units are installed, an overall control scheme based on juice weights will gradually come closer, and this change will be welcomed by all Queensland technologists.

Table IX—Production Data for Queensland Mills for Seasons 1952-1958 (Totals and Weighted Averages)

Northern District	1952	1953	1954	1955	1956	1957	1958
Cane—							
Tons	3,092,819	3,315,716	3,943,427	3,270,354	3,197,051	3,699,279	3,882,644
Pol per cent.	14.84	15.45	13.88	13.55	13.80	14.74	15.07
Fibre per cent.	11.24	11.61	10.93	11.38	11.74	11.21	11.20
C.c.s.	13.70	14.48	12.70	12.36	12.67	13.99	14.06
Purity 1st expressed juice	88.47	89.96	87.20	86.96	87.71	89.11	89.07
Sugar—							
Tons 94 net titre	421,921	467,716	502,276	413,853	406,172	516,345	540,476
Cane per ton sugar	7.40	7.09	7.85	7.90	7.87	7.16	7.18
Pol per cent.	98.66	98.81	98.50	98.60	98.78	98.66	98.36
Net titre	97.33	97.52	97.09	97.33	97.61	97.30	96.67
Dilution indicator	31.3	31.0	30.5	41.0	38.5	36.0	37.3
Pol per cent. pol cane	86.61	85.78	85.17	84.67	86.32	87.69	87.17
Mud—							
Tons	53,197	55,582	63,816	54,285	53,324	57,489	57,210
Mud per cent. cane	2.91	2.95	2.96	3.07	3.19	2.90	2.72
Pol per cent.	4.50	3.55	2.96	3.47	2.40	2.54	2.05
Pol per cent. pol cane	0.90	0.69	0.64	0.79	0.55	0.50	0.37
Molasses—							
Gallons (1,000's)	7,905	7,723	10,246	8,243	7,416	8,001	8,981
Gallons per ton cane	4.32	4.17	4.76	4.66	4.43	4.04	4.28
Brix	88.28	89.87	89.78	91.38	90.29	90.60	90.58
Apparent purity	31.66	33.97	32.49	31.87	30.05	30.76	29.16
True purity	43.36	45.71	44.31	44.40	41.82	42.77	41.67
Expected purity	37.99	38.90	38.0	38.4	37.8	38.34	37.58
Reducing sugars/ash	..	..	..	1.90	2.12	1.87	2.23
Pol per cent. pol cane	5.90	5.62	6.74	6.79	5.76	5.06	4.96
Final Bagasse—							
Tons	429,961	446,918	489,784	421,275	404,825	461,292	490,452
Bagasse per cent. cane	23.48	24.24	22.74	23.83	24.19	23.30	23.35
Pol per cent.	2.97	3.03	2.63	2.55	2.37	2.99	3.38
Dry substance	52.30	51.63	51.55	51.39	51.69	52.08	52.02
Pol per cent. pol cane	4.64	4.73	4.31	4.48	4.15	4.72	5.24
Undetermined loss—							
Pol per cent. pol cane	1.95	3.18	3.14	3.47	3.22	2.03	2.26
Fuels—							
Tons: Wood	5,175	5,181	3,498	4,909	9,691	6,300	5,899
Coal	0	0	40	42	111	71	96
Molasses	5,951	1,206	6,982	9,093	9,183	1,842	736

Burdekin District	1952	1953	1954	1955	1956	1957	1958
Cane—							
Tons	1,095,920	1,306,587	1,503,156	1,255,985	1,303,889	1,382,125	1,387,269
Pol per cent.	16.08	16.34	15.84	15.87	15.50	16.35	15.89
Fibre per cent.	11.51	11.79	11.55	11.67	12.40	12.15	11.70
C.c.s.	14.92	15.30	14.71	14.70	14.45	15.21	14.72
Purity first expressed juice	89.31	89.32	89.23	88.76	89.70	89.77	88.91
Sugar—							
Tons 94 net titre	161,871	193,483	218,505	179,664	184,607	208,250	204,812
Cane per ton sugar	6.77	6.75	6.88	6.99	7.06	6 64	6.77
Pol per cent.	98.78	98.87	98.82	98.65	98.72	98.52	98.83
Net titre	97.11	97.19	97.23	96.96	96.93	96.38	96.92
Dilution indicator	29.2	27.5	29.5	35.0	31.0	32.4	31.3
Pol per cent. pol cane	87.80	86.59	87.65	86.20	87.47	88.56	89.03
Mud—							
Tons	33,759	46,711	54,491	44,066	46,074	52,525	59,486
Mud per cent. cane	3.08	3.17	3.63	3.51	3.53	3.80	4.29
Pol per cent.	2.39	2.32	2.07	1.82	1.87	1.83	1.59
Pol per cent. pol cane	0.46	0.51	0.47	0.40	0.43	0.43	0.43
Molasses—							
Gallons (1,000's)	4,840	6,204	6,652	5,761	5,623	6,143	6,169
Gallons per ton cane	4.42	4.75	4.43	4.59	4.31	4.44	4.45
Brix	89.78	90.11	91.84	91.10	91.31	92.31	90.05
Apparent purity	32.58	35.26	34.93	34.94	35.76	34.54	32.78
True Purity	43.49	46.97	45.22	44.62	45.24	44.21	42.47
Expected purity	40.30	40.61	41.19	41.03	41.06	41.83	41.01
Reducing sugars/ash	..	..	..	1.19	1.15	0.99	1.20
Pol per cent. pol cane	5.42	5.88	6.12	6.18	6.04	5.79	5.46
Final Bagasse—							
Tons	252,031	312,937	340,976	294,263	312,732	331,460	318,499
Bagasse per cent. cane	23.00	23.95	22.68	23.43	23.98	23.98	22.96
Pol per cent.	2.87	3.31	3.08	3.17	2.77	3.19	3.13
Dry substance	54.18	53.93	53.87	53.55	55.28	54.68	54.97
Pol per cent. pol cane	4.05	4.85	4.49	4.69	4.30	4.68	4.53
Undetermined Loss—							
Pol per cent. pol cane	2.27	2.17	1.27	2.53	1.76	0.54	0.55
Fuels—							
Tons: Wood	1,381	2,756	2,124	2,150	3,521	1,837	928
Coal	137	130	69	39	353	0	233
Molasses	0	0	0	0	0	238	0

Table IX—continued.

Mackay District	1952	1953	1954	1955	1956	1957	1958
Cane—							
Tons	1,589,767	2,467,243	2,616,619	2,386,011	2,462,019	2,702,060	2,563,034
Pol per cent.	15.86	15.85	14.94	15.40	14.84	15.46	15.43
Fibre per cent.	13.28	13.42	14.40	15.12	15.02	14.77	14.53
C.c.s.	14.72	14.71	13.87	14.22	13.71	14.33	14.29
Purity first expressed juice	89.73	88.56	89.54	88.85	88.97	89.60	89.28
Sugar—							
Tons 94 net titre	226,472	354,165	352,362	329,482	323,631	378,793	359,112
Cane per ton sugar	7.02	6.97	7.43	7.24	7.61	7.13	7.14
Pol per cent.	98.84	99.01	98.97	98.86	98.88	98.68	98.71
Net titre	97.56	97.97	97.79	97.57	97.59	97.04	97.07
Dilution indicator	30.4	30.5	26.8	34.3	33.9	29.7	32.6
Pol per cent. pol cane	85.52	86.06	85.74	85.40	84.34	86.70	86.77
Mud—							
Tons	47,380	87,182	90,671	84,049	90,763	103,938	97,889
Mud per cent. cane	3.54	3.65	3.47	3.52	3.69	3.85	3.82
Pol per cent.	3.80	3.28	2.91	2.92	2.72	2.83	2.91
Pol per cent. pol cane	0.78	0.74	0.68	0.66	0.67	0.70	0.72
Molasses—							
Gallons (1,000's)	7,733	12,486	11,575	11,917	10,592	10,456	10,370
Gallons per ton cane	4.86	5.06	4.42	4.99	4.30	3.87	4.05
Brix	89.73	89.57	89.17	90.86	89.73	90.85	90.24
Apparent purity	35.30	34.31	36.07	34.53	36.25	34.10	33.32
True purity	42.35	43.41	43.60	42.89	43.53	41.92	41.29
Expected purity	40.51	39.42	40.45	39.99	40.25	40.62	40.04
Reducing sugars/ash	..	..	..	1.40	1.32	1.26	1.42
Pol per cent. pol cane	6.27	6.28	5.92	6.33	6.22	5.15	5.22
Final Bagasse—							
Tons	443,806	697,410	775,206	757,762	785,458	834,597	773,958
Bagasse per cent. cane	27.91	28.27	29.63	31.76	31.90	30.89	30.20
Pol per cent.	2.46	2.97	2.70	2.76	2.60	2.91	2.97
Dry substance	51.41	51.31	52.14	51.41	51.17	51.51	51.89
Pol per cent. pol cane	4.29	5.25	5.35	5.70	5.60	5.81	5.81
Undetermined Loss—							
Pol per cent. pol cane	3.14	1.67	2.31	1.91	3.17	1.64	1.48
Fuels—							
Tons : Wood	2,441	4,229	1,470	1,903	2,852	1,136	1,505
Coal	96	51	12	0	50	114	0
Molasses	0	0	0	0	0	0	0

Southern District	1952	1953	1954	1955	1956	1957	1958
Cane—							
Tons	1,063,030	1,661,517	1,801,103	1,703,813	2,015,122	1,162,153	1,907,848
Pol per cent.	13.21	13.82	14.08	14.12	14.29	14.91	14.60
Fibre per cent.	14.19	13.52	14.77	14.70	14.17	14.61	14.09
C.c.s.	11.90	12.51	12.91	12.89	13.12	13.68	13.38
Purity first expressed juice	85.40	85.90	87.80	87.22	87.81	87.90	88.03
Sugar—							
Tons 94 net titre	124,350	205,019	228,102	212,676	257,460	152,883	249,143
Cane per ton sugar	8.55	8.10	7.90	8.01	7.83	7.60	7.66
Pol per cent.	98.94	98.90	99.00	98.83	98.57	98.49	98.74
Net titre	97.55	97.51	97.68	97.26	96.64	96.44	96.88
Dilution indicator	31.5	29.6	32.8	35.9	34.8	33.5	32.0
Pol per cent. pol cane	84.62	85.03	85.82	84.58	85.75	84.92	85.81
Mud—							
Tons	37,451	57,018	65,650	61,903	71,324	44,428	70,727
Mud per cent. cane	3.56	3.47	3.70	3.69	3.59	3.92	3.81
Pol per cent.	2.70	2.67	2.73	2.91	3.08	2.89	2.75
Pol per cent. pol cane	0.72	0.67	0.72	0.76	0.77	0.76	0.72
Molasses—							
Gallons (1,000's)	5,232	7,678	7,248	7,708	8,117	5,117	8,225
Gallons per ton cane	4.97	4.67	4.09	4.59	4.09	4.52	4.43
Brix	91.77	91.71	91.57	91.84	91.99	91.51	91.45
Apparent purity	34.44	32.75	36.13	36.10	36.62	37.57	36.13
True purity	43.24	41.74	43.00	44.38	45.00	45.55	44.94
Expected purity	41.09	40.40	42.00	42.60	42.8	42.39	42.29
Reducing sugars/ash	..	..	..	0.88	0.90	0.90	0.93
Pol per cent. pol cane	7.98	6.54	6.42	7.34	6.42	6.94	6.66
Final Bagasse—							
Tons	317,961	477,531	567,691	518,682	588,925	355,219	544,456
Bagasse per cent. cane	30.23	29.17	32.00	30.91	29.66	31.37	29.30
Pol per cent.	2.10	2.46	2.41	2.45	2.78	2.72	2.61
Dry substance	49.87	49.46	49.29	50.73	50.89	50.06	51.29
Pol per cent. pol cane	4.75	5.19	5.48	5.35	5.77	5.72	5.24
Undetermined Loss—							
Pol per cent. pol cane	1.93	2.57	1.56	1.90	1.29	1.66	1.57
Fuels—							
Tons : Wood	3,493	4,774	4,595	4,332	2,693	3,374	2,998
Coal	511	519	308	108	99	152	131
Molasses	0	0	0	0	0	0	0

Table IX—continued.

All Queensland Districts	1952	1953	1954	1955	1956	1957	1958
Cane—							
Tons	6,841,536	8,751,063	9,864,305	8,616,163	8,978,081	8,945,617	9,740,795
Pol per cent.	15.07	15.38	14.64	14.72	14.58	15.34	15.22
Fibre per cent.	12.44	12.69	13.02	13.48	13.59	13.26	13.05
C.c.s.	13.90	14.26	13.50	13.53	13.45	14.24	14.08
Purity first expressed juice	88.21	88.45	88.47	87.97	88.49	89.21	88.90
Sugar—							
Tons 94 net titre	934,614	1,220,383	1,301,245	1,135,675	1,171,870	1,256,271	1,353,543
Cane per ton sugar	7.32	7.17	7.58	7.59	7.66	7.12	7.20
Pol per cent.	97.78	98.91	98.83	98.75	98.75	98.61	98.65
Net titre	97.38	97.61	97.47	97.33	97.22	96.88	96.89
Dilution indicator	30.5	29.9	29.9	36.5	35.0	32.5	33.8
Pol per cent. pol cane	86.21	85.88	86.00	85.20	85.72	87.07	87.07
Mud—							
Tons	171,787	246,493	274,628	244,303	261,485	258,380	285,312
Mud per cent. cane	3.23	3.36	3.41	3.45	3.52	3.59	3.61
Pol per cent.	3.56	3.02	2.71	2.84	2.60	2.57	2.42
Pol per cent. pol cane	0.70	0.67	0.63	0.66	0.63	0.60	0.57
Molasses—							
Gallons (1,000's)	25,710	34,091	35,721	33,629	31,748	29,717	33,745
Gallons per ton cane	4.62	4.69	4.44	4.74	4.28	4.13	4.27
Brix	90.04	90.22	90.34	91.25	90.72	91.20	90.59
Apparent purity	33.61	34.05	34.84	34.31	34.81	33.89	32.80
True purity	43.32	44.20	43.98	43.90	43.80	43.25	42.50
Expected purity	39.90	39.70	40.20	40.40	40.4	40.56	40.11
Reducing sugars/ash	..	..	..	1.32	1.30	1.26	1.40
Pol per cent. pol cane	6.25	6.09	6.28	6.63	6.14	5.53	5.52
Final Bagasse—							
Tons	1,443,759	1,934,796	2,173,657	1,991,982	2,091,940	1,982,568	2,127,365
Bagasse per cent. cane	25.93	27.03	27.01	28.10	28.18	27.55	26.90
Pol	2.60	2.91	2.67	2.69	2.63	2.94	3.00
Dry substance	51.82	51.35	51.53	51.54	51.81	51.91	52.23
Pol per cent. pol cane	4.43	5.03	4.94	5.15	5.09	5.28	5.30
Undetermined Loss—							
Pol per cent. pol cane	2.41	2.53	2.15	2.38	2.42	1.52	1.54
Fuels—							
Tons : Wood	12,562	16,940	11,687	13,294	18,757	12,647	11,330
Coal	744	700	1,152	189	613	337	460
Molasses	5,951	1,206	6,982	9,093	9,183	2,080	736

Tons of cane, tons of sugar, tons of cane per ton of sugar and c.c.s. (1957 and 1958 only), include all mills. All other figures exclude C.S.R. and Rocky Point mills.

Table X

Tons of Cane per ton 94 Net Titre Sugar, 1949-1958

Season	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Tons Cane per ton 94 N.T. Sugar	7.26	7.61	7.11	7.32	7.17	7.58	7.59	7.66	7.12	7.20

Table XI

Sugar Produced in Districts, 1958 Season, with Peak Allocations

Districts	Tons 94 Net Titre Sugar			Production per cent. Peak
	Produced	Peak	Excess Production over Peak	
Northern	540,476	485,400	+ 55,076	111.35
Burdekin	204,812	180,500	+ 24,312	113.47
Mackay	359,112	311,000	+ 48,112	115.47
Southern	249,143	230,500	+ 18,643	108.09
All Districts	1,353,543	1,207,400	+146,143	112.10

Table XII

Figures for 1958 Season (Totals and Arithmetic Averages)

——	Northern	Burdekin	Mackay	Southern	All Districts
Tons Cane Crushed	3,882,644	1,387,269	2,563,034	1,907,848	9,740,795
Tons 94 N.T. Sugar made	540,476	204,812	359,112	249,143	1,353,543
Net Titre of Sugar	96.71	96.94	97.05	96.80	96.88
Tons Cane per ton 94 N.T. Sugar	7.19	6.77	7.14	7.76	7.29
C.c.s. of Cane	14.07	14.80	14.30	13.39	14.02
Coefficient of Work	98.28	99.90	97.95	97.55	98.20
Coefficient of Work E.S.G.	98.53	95.39	93.27	93.13	93.61
Crushing Rate	126.48	118.38	123.23	93.21	113.99
Lost Time per cent. Available Time	6.92	6.91	5.68	7.27	6.65
Fibre of Cane	11.21	11.92	14.48	14.20	13.24
Pol of Cane	15.11	15.97	15.44	14.58	15.18
First Expressed Juice—					
Brix	20.25	21.60	21.45	20.44	20.90
Purity	89.10	89.04	89.31	87.94	88.85
Purity—					
Clarified Juice	88.25	88.18	88.75	86.92	87.98
Syrup	88.16	88.67	88.32	86.99	87.97
Dilution per cent. First Expressed Juice	24.46	33.90	32.61	35.07	31.65
Final Bagasse—					
Pol	3.41	3.21	2.95	2.69	3.02
Dry Substance	52.16	54.83	51.73	51.27	52.16
Pol Extraction	94.70	95.21	94.22	94.52	94.57
Reduced Extraction	94.03	95.01	95.10	95.29	94.90
Final Molasses—					
Gallons per ton Cane	4.27	4.46	4.07	4.44	4.29
Brix	90.37	89.93	90.14	90.80	90.36
Apparent Purity	29.48	32.95	33.40	36.13	33.26
True Purity	41.81	42.76	41.52	44.93	42.83
Expected Purity	37.68	40.95	40.18	42.09	40.31
Reducing Sugars/Ash	2.20	1.22	1.42	0.98	1.43
Final Mud—					
Per cent. Cane	2.66	3.99	3.96	3.98	3.67
Pol per cent. Mud	1.97	1.67	3.02	2.82	2.51
Sugar—					
Pol	98.38	98.83	98.71	98.71	98.65
Reducing Sugars	0.49	0.28	0.35	0.28	0.35
Ash	0.24	0.32	0.26	0.33	0.29
Moisture	0.44	0.28	0.32	0.31	0.34
Dilution Indicator	37	31	33	32	33
Pol Balance—					
Sugar (Recovery)	87.03	88.72	86.70	85.45	86.70
Bagasse Loss	5.30	4.80	5.78	5.49	5.43
Molasses Loss	4.97	5.48	5.24	6.64	5.64
Mud Loss	0.36	0.41	0.76	0.75	0.61
Undetermined Loss	2.34	0.59	1.52	1.67	1.62
Recovery overall E.S.G.	86.61	88.40	86.36	85.11	86.35
Recovery on mixed juice	91.91	93.18	92.02	90.40	91.67
Recovery on mixed juice E.S.G.	91.46	92.84	91.65	90.04	91.30
Boiling House Efficiency	96.64	98.01	96.42	95.62	96.54
Boiling House Efficiency E.S.G.	96.17	97.66	96.04	95.23	96.14
Fuels (as equivalent Bagasse per cent. Cane)—					
Wood	0.54	0.12	0.12	0.43	0.31
Coal	0.02	0.06	0.00	0.02	0.02
Molasses	0.05	0.00	0.00	0.00	0.01
Total added	0.61	0.18	0.12	0.45	0.34
Bagasse	24.61	26.53	31.62	30.60	28.91
Total Fuel	25.22	26.71	31.74	31.05	29.25
Crop Days	1,755	719	1,222	1,294	4,990

Tons of cane, tons of sugar, tons of cane per ton of sugar, c.c.s. of cane and crop days include all mills. All other figures exclude C.S.R. and Rocky Point mills.

Table XIII
Cane Milled and Sugar Yielded, 1958 Season

Mills	Tons Cane Crushed	* Tons 94 n.t. Sugar made	Tons Cane per ton Sugar	
			1958	1957
Mossman	254,389	35,653	7.135	7.124
Hambledon	376,573	54,299	6.935	6.859
Mulgrave	393,665	54,511	7.222	7.253
Babinda	361,207	48,507	7.446	7.457
Goondi	274,982	38,315	7.177	7.227
Mourilyan	262,896	36,276	7.247	7.473
South Johnstone	404,663	56,047	7.220	7.374
Tully	423,756	57,466	7.374	7.510
Victoria	728,027	102,485	7.104	6.888
Macknade	402,486	56,917	7.071	6.904
Northern District Totals and Averages	3,882,644	540,476	7.184	7.164
Invicta	195,570	28,974	6.750	6.956
Pioneer	367,845	54,110	6.798	6.618
Kalamia	375,941	56,226	6.686	6.538
Inkerman	447,913	65,502	6.838	6.576
Burdekin District Totals and Averages	1,387,269	204,812	6.773	6.637
Proserpine	376,815	51,906	7.260	7.128
Farleigh	367,909	50,973	7.218	7.291
Racecourse	357,701	51,051	7.007	7.195
Pleystowe	363,074	51,936	6.991	7.010
Marian	354,452	48,261	7.344	7.187
Cattle Creek	177,285	24,136	7.345	7.175
North Eton	209,035	30,022	6.963	7.026
Plane Creek	356,763	50,827	7.019	7.043
Mackay District Totals and Averages	2,563,034	359,112	7.137	7.133
Fairymead	330,075	43,090	7.660	7.941
Qunaba	153,542	20,651	7.435	7.604
Millaquin	311,260	42,243	7.368	7.404
Bingera	318,573	42,079	7.571	7.481
Gin Gin	90,245	10,639	8.482	8.284
Isis	308,044	38,715	7.957	7.599
Maryborough	176,117	22,597	7.794	7.890
Moreton	170,555	23,054	7.398	7.298
Rocky Point	49,437	6,075	8.138	8.385
Southern District Totals and Averages	1,907,848	249,143	7.658	7.602
All Districts Totals and Averages	9,740,795	1,353,543	7.197	7.121

* Local Sales included.

TABLE XIV
Analysis of Gross Time, 1958 Season, excluding C.S.R. and Rocky Point Mills

	Total Hours	Per Cent. Gross Total Hours	Per Cent. of Available Hours
Crushing Time	68,203.49	68.19	93.43
Lost Time—			
Manufacture	3,019.47	3.02	4.14
Cane Supply	1,772.34	1.77	2.43
Total Available Hours	72,995.30	72.98	100.00
Premeditated and Week-end Stops	27,026.03	27.02	
Gross Total Hours	100,021.33	100.00	

Table XV

*** Fuels Calculated as Equivalent Bagasse Per Cent. Cane, 1952-1958**
(Arithmetic Averages)

Year	Wood	Coal, etc.	Molasses	Total Added	Bagasse	Total Fuel
NORTHERN DISTRICT						
1952	0.598	..	0.640	1.238	27.413	28.651
1953	0.562	..	0.111	0.673	25.413	26.086
1954	0.308	0.008	0.434	0.750	23.952	24.702
1955	0.550	0.010	0.627	1.187	24.945	26.132
1956	1.057	0.025	0.777	1.859	25.402	27.261
1957	0.597	0.011	0.125	0.733	24.753	25.487
1958	0.540	0.017	0.045	0.602	24.618	25.220
BURDEKIN DISTRICT						
1952	0.305	0.038	..	0.343	28.378	28.721
1953	0.493	0.033	..	0.526	27.118	27.644
1954	0.308	0.015	..	0.323	25.455	25.778
1955	0.380	0.010	..	0.390	26.163	26.553
1956	0.553	0.090	..	0.643	27.523	28.166
1957	0.330	..	0.040	0.370	27.505	27.875
1958	0.123	0.055	..	0.178	26.530	26.708
MACKAY DISTRICT						
1952	0.344	0.025	..	0.369	31.571	31.940
1953	0.293	0.010	..	0.303	28.943	29.246
1954	0.115	0.001	..	0.116	31.401	31.517
1955	0.164	..	..	0.164	32.895	33.059
1956	0.213	0.006	..	0.219	32.961	33.180
1957	0.083	0.013	..	0.095	32.188	32.283
1958	0.123	..	..	0.123	31.618	31.741
SOUTHERN DISTRICT						
1952	1.160	0.110	..	1.270	33.614	34.884
1953	0.956	0.078	..	1.034	29.309	30.343
1954	0.845	0.044	..	0.889	31.767	32.656
1955	0.774	0.017	..	0.791	31.980	32.771
1956	0.378	0.012	..	0.390	30.806	31.196
1957	1.480	0.036	..	1.516	31.473	32.989
1958	0.425	0.021	..	0.446	30.598	31.044
ALL QUEENSLAND DISTRICTS						
1952	0.648	0.047	0.148	0.843	30.748	31.591
1953	0.589	0.032	0.026	0.647	27.960	28.607
1954	0.414	0.018	0.100	0.532	28.880	29.412
1955	0.474	0.009	0.145	0.628	29.743	30.371
1956	0.510	0.025	0.179	0.714	29.717	30.431
1957	0.669	0.017	0.035	0.722	29.532	30.253
1958	0.312	0.019	0.010	0.341	28.906	29.247

* Excluding C.S.R. and Rocky Point mills.

Table XVI
Total Crop Days, All Mills, 1949-1958

——	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Total Crop Days ..	5,593	6,469	4,089	5,046	5,515	6,110	5,397	5,605	4,690	4,990

Average Crushing Rates, 1949-1958, excluding C.S.R. and Rocky Point Mills
(Arithmetic Averages)

——	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Tons cane per hour	68.74	72.35	71.47	78.28	87.15	93.51	97.20	102.25	109.46	113.99

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